

ERL

ENVIRONMENTAL RESEARCH LETTERS

erl.iop.org

Highlights

A compilation of the best articles
published in the last year





How to submit your research

Here are our recommendations for successfully submitting your article to *Environmental Research Letters*.

Submission requirements

The journal accepts brief letter-style articles of high quality, reporting new and original research and appealing to the journal's broad readership. For more information on specific submission requirements, please visit the website at erl.iop.org and click on 'Submission requirements'.

Plan

Consider the best way to structure your article before you start. *Environmental Research Letters* does not have a template, but asks that you submit your manuscript in single-column, double-sided format.

Choose a title that best serves your needs—an eye-catching one to attract as many readers as possible, or a descriptive one to engage readers with a specific interest in your area.

Give some thought to your abstract. It should very concisely describe the content of your article, and encourage readers to view the entire article. No jargon or undefined abbreviations should be used.

Writing

Be clear and concise. Consider the broad readership of the journal, bearing in mind the knowledge expected of that audience. All content in your article should be relevant to your main scientific result.

Editing

Reconsider your original plan. You may decide to rewrite portions of your article to improve clarity and conciseness. You should repeat these processes over several successive drafts if necessary. Once the draft is ready to be submitted to the journal, carry out one final spelling and grammar check before submission.

Submission

All of our journals operate a fast online submission system. Simply visit the journal homepage at erl.iop.org and click on the 'Submit an article' link. This will take you through to our online submission pages, where you will need to follow the steps described.



To help early career researchers prepare their papers for publication, we have published a digital 'Introductory guide for authors' brochure available at iopscience.org/author-guide.



Welcome

Daniel M Kammen
Editor-in-Chief

2012 has been a remarkable year for ERL. The number of article submissions has set a new annual record, and both the quality and breadth of articles we receive truly reflects the space envisioned for a journal designed to cover all of the environmental sciences. ERL now has an Impact Factor of 3.631, remarkable for a six-year old journal, but one fitting its role as a 'must read' location for high-impact results that warrant rapid publication, and in an open access format. ERL continues to innovate in terms of article format and accessibility, including video abstracts, as well as a new 'Creative Commons CC-BY' licence, allowing more liberal reuse of materials from published articles.

ERL has consistently featured in the international news, with articles receiving citations and commentary in *Science*, *Nature*, *The Economist*, the *Guardian* and the *New York Times*. Published articles have been at the forefront of research highlighting many critical areas, including greenhouse gas emission assessments, sea-level rise, community response strategies to environmental change, linkages between environmental change and conflict, and the role of journalism in climate issues. Finally, our focus issues are creating and aiding networks of researchers and users of coordinated knowledge.

Vital to this story is both the tremendously talented – award-winning – Editorial board at ERL (a group that I note again and again as the most exceptional 'virtual faculty' I have ever worked with!), and the service that the IOP editorial team provides to this group, and to the authors and readers of ERL.








From the Publisher

Guillaume Wright
Publisher

ERL's recent progress has been extraordinary, and alongside its sister community website *environmentalresearchweb*, has surpassed many of our expectations during 2012. The 25 outstanding articles featured here represent only a fraction of the ground-breaking research published in the journal this year. My sincere thanks to the journal's Editorial board, authors, readers and supporters for making this possible.

Contents

	Featured article: Arctic warming, increasing snow cover and widespread boreal winter cooling Judah L Cohen, Jason C Furtado, Mathew A Barlow, Vladimir A Alexeev and Jessica E Cherry	6
	Greenhouse gases, climate change and the transition from coal to low-carbon electricity N P Myhrvold and K Caldeira	8
	Modelling sea level rise impacts on storm surges along US coasts Claudia Tebaldi, Benjamin H Strauss and Chris E Zervas	8
	Tidally adjusted estimates of topographic vulnerability to sea level rise and flooding for the contiguous United States Benjamin H Strauss, Remik Ziemlinski, Jeremy L Weiss and Jonathan T Overpeck	9
	Featured article: Quantitative maps of groundwater resources in Africa A M MacDonald, H C Bonsor, B É Ó Dochartaigh and R G Taylor	10
	Reckoning wheat yield trends M Lin and P Huybers	12
	Tropical seagrass meadows modify seawater carbon chemistry: implications for coral reefs impacted by ocean acidification Richard K F Unsworth, Catherine J Collier, Gideon M Henderson and Len J McKenzie	12
	Attribution of atmospheric CO ₂ and temperature increases to regions: importance of preindustrial land use change Julia Pongratz and Ken Caldeira	13
	Sources of multi-decadal variability in Arctic sea ice extent J J Day, J C Hargreaves, J D Annan and A Abe-Ouchi	14
	Model simulations on the long-term dispersal of ¹³⁷ Cs released into the Pacific Ocean off Fukushima Erik Behrens, Franziska U Schwarzkopf, Joke F Lübbecke and Claus W Böning	14
	Cost analysis of stratospheric albedo modification delivery systems Justin McClellan, David W Keith and Jay Apt	15
	Seasonal forecasts of northern hemisphere winter 2009/10 D R Fereday, A Maidens, A Arribas, A A Scaife and J R Knight	16
	Evaluating the energy consumed for water use in the United States Kelly T Sanders and Michael E Webber	16

Millennial total sea-level commitments projected with the Earth system model of intermediate complexity LOVECLIM Heiko Goelzer, Philippe Huybrechts, Sarah Raper, Marie France Loutre, Hugues Goosse and Thierry Fichefet	17
Cross-national comparison of the presence of climate scepticism in the print media in six countries, 2007–10 James Painter and Teresa Ashe	18
Representative concentration pathways and mitigation scenarios for nitrous oxide Eric A Davidson	19
Evidence of recent causal decoupling between solar radiation and global temperature Antonello Pasini, Umberto Triacca and Alessandro Attanasio	19
Featured article: Comparing climate projections to observations up to 2011 Stefan Rahmstorf, Grant Foster and Anny Cazenave	20
Observed decreases in the Canadian outdoor skating season due to recent winter warming Nikolay N Damyanov, H Damon Matthews and Lawrence A Mysak	22
Terrestrial carbon losses from mountaintop coal mining offset regional forest carbon sequestration in the 21st century J Elliott Campbell, James F Fox and Peter M Acton	22
Methane and nitrous oxide emissions affect the life-cycle analysis of algal biofuels Edward D Frank, Jeongwoo Han, Ignasi Palou-Rivera, Amgad Elgowainy and Michael Q Wang	23
The long-term effect of increasing the albedo of urban areas Hashem Akbari, H Damon Matthews and Donny Seto	24
Shale gas production: potential versus actual greenhouse gas emissions Francis O'Sullivan and Sergey Paltsev	24
 Improving environmental change research with systematic techniques for qualitative scenarios Vanessa Jine Schweizer and Elmar Kriegler	25
Environmental changes and violent conflict Thomas Bernauer, Tobias Böhmelt and Vally Koubi	26
Focus issues	28
Editorial board	29

Featured article

Best
article of
2012
winner

This paper has been awarded ERL's 'Best article of 2012',
voted for by members of the ERL Editorial board



Judah L Cohen
Atmospheric and
Environmental
Research Inc., USA

Arctic warming, increasing snow cover and widespread boreal winter cooling

**Judah L Cohen, Jason C Furtado, Mathew A Barlow, Vladimir A Alexeev
and Jessica E Cherry**

2012 *Environ. Res. Lett.* **7** 014007

Abstract

The most up to date consensus from global climate models predicts warming in the Northern Hemisphere (NH) high latitudes to middle latitudes during boreal winter. However, recent trends in observed NH winter surface temperatures diverge from these projections. For the last two decades, large-scale cooling trends have existed instead across large stretches of eastern North America and northern Eurasia. We argue that this unforeseen trend is probably not due to internal variability alone. Instead, evidence suggests that summer and autumn warming trends are concurrent with increases in high-latitude moisture and an increase in Eurasian snow cover, which dynamically induces large-scale wintertime cooling. Understanding this counterintuitive response to radiative warming of the climate system has the potential for improving climate predictions at seasonal and longer timescales.

Media coverage

- *Science*

Global warming may trigger winter cooling

<http://news.sciencemag.org/sciencenow/2012/01/global-warming-may-trigger-winte.html>

- *The Guardian*

Weatherwatch: Winters in northern hemisphere set to get colder

www.guardian.co.uk/news/2012/jan/22/weatherwatch-global-warming-climate-change

- *Financial Times*

Why global warming means... more snow

www.ft.com/cms/s/2/9d092c98-4184-11e1-8c33-00144feab49a.html#axzz1kZiCb9Su

Global warming set to bring colder, snowier winters

Judah Cohen and colleagues talk to ERL's sister community website, [environmentalresearchweb](http://environmentalresearchweb.org), about their latest research in ERL.

The world is getting warmer, which should mean warmer winters – right? Wrong – a new study in *Environmental Research Letters* shows that global warming produces colder winters and heavier dumps of snow for large swathes of the northern hemisphere. The research suggests that colder winters have become more frequent over the past two decades. Judah Cohen, from Atmospheric and Environmental Research (AER) in Massachusetts, US, and his colleagues studied northern hemisphere temperature, humidity, snow cover, and sea ice cover data from the last 20 years. They show that as northern hemisphere summer temperatures have risen, September sea ice cover on the Arctic Ocean has shrunk. At the same time atmospheric moisture levels in the Arctic have risen, October snowfall across Eurasia has increased, and winters have become colder.

“Possibly the increase in open water over the Arctic Ocean means that more moisture can be evaporated into the atmosphere, leading to increased precipitation events,” Cohen told *environmentalresearchweb*. In addition, a warmer atmosphere is capable of holding more moisture. Previous work has shown that increased autumn snowfall across Eurasia triggers a negative Arctic Oscillation pattern, leading to colder winter temperatures across eastern US, Europe and eastern Asia. Meanwhile, north-eastern Canada, the Mediterranean and North Africa all experience warmer than average winters.

The new data suggest that the probability of a negative Arctic Oscillation establishing has been increasing since the 1980s, and Cohen sees no reason why increasing autumn snow cover will cease to favour a negative winter Arctic Oscillation in the coming decades. However, if summer and autumn temperatures continue to rise then the extra atmospheric moisture may fall as autumn rain, rather than snow. Now Cohen and his colleagues are hoping to incorporate this negative feedback pattern into climate models, to improve future predictions.



To read the story in full on *environmentalresearchweb*, go to

environmentalresearchweb.org/cws/article/news/48293

Research articles



Ken Caldeira
Carnegie Institution,
USA

Greenhouse gases, climate change and the transition from coal to low-carbon electricity

N P Myhrvold and K Caldeira

2012 *Environ. Res. Lett.* **7** 014019

A transition from the global system of coal-based electricity generation to low-greenhouse-gas-emission energy technologies is required to mitigate climate change in the long term. The use of current infrastructure to build this new low-emission system necessitates additional emissions of greenhouse gases, and the coal-based infrastructure will continue to emit substantial amounts of greenhouse gases as it is phased out. Furthermore, ocean thermal inertia delays the climate benefits of emissions reductions. By constructing a quantitative model of energy system transitions that includes life-cycle emissions and the central physics of greenhouse warming, we estimate the global warming expected to occur as a result of build-outs of new energy technologies ranging from 100 GW_e to 10 TW_e in size and 1–100 yr in duration. We show that rapid deployment of low-emission energy systems can do little to diminish the climate impacts in the first half of this century. Conservation, wind, solar, nuclear power, and possibly carbon capture and storage appear to be able to achieve substantial climate benefits in the second half of this century; however, natural gas cannot.



Featured on *environmentalresearchweb*

"No time to waste" on transition to green energy

environmentalresearchweb.org/cws/article/news/48649



Claudia Tebaldi
Climate Central, USA

Modelling sea level rise impacts on storm surges along US coasts

Claudia Tebaldi, Benjamin H Strauss and Chris E Zervas

2012 *Environ. Res. Lett.* **7** 014032

Sound policies for protecting coastal communities and assets require good information about vulnerability to flooding. Here, we investigate the influence of sea level rise on expected storm surge-driven water levels and their frequencies along the contiguous United States. We use model output for global temperature changes, a semi-empirical model of global sea level rise, and long-term records from 55 nationally distributed tidal gauges to develop sea level rise projections at each gauge location. We employ more detailed records over the period 1979–2008 from the same gauges to elicit historic patterns of extreme high water events, and combine these statistics with anticipated relative sea level rise to project changing local extremes through 2050. We find that

substantial changes in the frequency of what are now considered extreme water levels may occur even at locations with relatively slow local sea level rise, when the difference in height between presently common and rare water levels is small. We estimate that, by mid-century, some locations may experience high water levels annually that would qualify today as 'century' (i.e., having a chance of occurrence of 1% annually) extremes. Today's century levels become 'decade' (having a chance of 10% annually) or more frequent events at about a third of the study gauges, and the majority of locations see substantially higher frequency of previously rare storm-driven water heights in the future. These results add support to the need for policy approaches that consider the non-stationarity of extreme events when evaluating risks of adverse climate impacts.



Featured on *environmentalresearchweb*

US Pacific coast most vulnerable to extreme high waters

environmentalresearchweb.org/cws/article/news/48935



Benjamin H Strauss
Climate Central, USA

Tidally adjusted estimates of topographic vulnerability to sea level rise and flooding for the contiguous United States

Benjamin H Strauss, Remik Ziemlinski, Jeremy L Weiss and Jonathan T Overpeck

2012 *Environ. Res. Lett.* **7** 014033

Because sea level could rise 1 m or more during the next century, it is important to understand what land, communities and assets may be most at risk from increased flooding and eventual submersion. Employing a recent high-resolution edition of the National Elevation Dataset and using VDatum, a newly available tidal model covering the contiguous US, together with data from the 2010 Census, we quantify low-lying coastal land, housing and population relative to local mean high tide levels, which range from ~0 to 3 m in elevation (North American Vertical Datum of 1988). Previous work at regional to national scales has sometimes equated elevation with the amount of sea level rise, leading to underestimated risk anywhere where the mean high tide elevation exceeds 0 m, and compromising comparisons across regions with different tidal levels. Using our tidally adjusted approach, we estimate the contiguous US population living on land within 1 m of high tide to be 3.7 million. In 544 municipalities and 38 counties, we find that over 10% of the population lives below this line; all told, some 2150 towns and cities have some degree of exposure. At the state level, Florida, Louisiana, California, New York and New Jersey have the largest sub-meter populations. We assess topographic susceptibility of land, housing and population to sea level rise for all coastal states, counties and municipalities, from 0 to 6 m above mean high tide, and find important threat levels for widely distributed communities of every size. We estimate that over 22.9 million Americans live on land within 6 m of local mean high tide.



Featured on *environmentalresearchweb*

Assessing US vulnerability to sea-level rise

environmentalresearchweb.org/cws/article/news/48934

Featured article



Alan MacDonald
British Geological
Survey, UK

Quantitative maps of groundwater resources in Africa

A M MacDonald, H C Bonsor, B É Ó Dochartaigh and R G Taylor

2012 *Environ. Res. Lett.* **7** 024009

Abstract

In Africa, despite groundwater being the major source of drinking water and its use for irrigation is forecast to increase substantially, there is little quantitative information on groundwater resources. Here we present the first quantitative continent-wide maps of aquifer storage and potential borehole yields in Africa based on an extensive review of available maps, publications and data. We estimate total groundwater storage in Africa to be 0.66 million km³ (0.36–1.75 million km³). Not all of this groundwater storage is available for abstraction, but the estimated volume is more than 100 times estimates of annual renewable freshwater resources on Africa, although the resources are unevenly distributed by country. Nevertheless, for many African countries appropriately sited and constructed boreholes can support handpump abstraction (yields of 0.1–0.3 l s⁻¹), and contain sufficient storage to sustain abstraction through inter-annual variations in recharge. Potential for higher yielding boreholes (> 5 l s⁻¹) is much more limited and therefore, strategies for increasing irrigation or supplying water that are predicated on the widespread drilling of high yielding boreholes are likely to be unsuccessful. As groundwater is the largest and most widely distributed store of freshwater in Africa, the quantitative maps are intended to lead to more realistic assessments of water security and water stress, and to promote a more quantitative approach to mapping of groundwater resources at national and regional level.

Media coverage

- BBC
'Huge' water resource exists under Africa
www.bbc.co.uk/news/science-environment-17775211
- *The Huffington Post*
Africa groundwater maps could help improve access to water
www.huffingtonpost.com/2012/04/20/africa-groundwater-maps-improvements_n_1441038.html
- Reuters
Africa sitting on sea of groundwater reserves
www.reuters.com/article/2012/04/20/us-africa-water-idUSBRE83J0W520120420

African groundwater offers hope for climate variability ‘buffer’

Alan MacDonald and colleagues talk to ERL's sister community website, *environmentalresearchweb*, about their latest research in ERL.

Groundwater is the major source of drinking water in Africa and is likely to be used increasingly for irrigation of food crops. But little is known about how much there actually is, and so assessments of freshwater availability do not include groundwater storage. Now a team from the UK has estimated Africa's groundwater resources for the first time.

According to Alan MacDonald of the British Geological Survey, Africa's groundwater resources are estimated to be more than 100 times the annual renewable freshwater resources and 20 times more than is stored in Africa's freshwater lakes. “We also show that this groundwater will not be available for widespread development of high-yielding boreholes (for example, for irrigation), but is likely to support low-yielding boreholes for drinking-water supply and small community-scale irrigation,” he told *environmentalresearchweb*. More than 300 million people in Africa do not have access to safe drinking water, and only 5% of arable land is irrigated.

To obtain the result, MacDonald and colleagues reviewed available maps, publications and data to create the first quantitative continent-wide maps of aquifer storage and potential borehole yields. The team estimated the total groundwater storage in Africa at 0.66 million km³, with a range of 0.36 to 1.7 million km³. “There has been very little information on the volume of groundwater available and how it will respond to climate change – consequently it is very rarely taken into account when discussing water scarcity,” said MacDonald. “We thought it was about time to start gathering quantitative information so people have some evidence on which to make decisions on groundwater development.”



To read the story in full on *environmentalresearchweb*, go to

environmentalresearchweb.org/cws/article/news/49350

IOP CONFERENCE SERIES: EARTH AND ENVIRONMENTAL SCIENCE



ERL's sister-journal *IOP Conference Series: Earth and Environmental Science* (EES) provides a parallel proceedings publication service. Content is published on an open access basis and coverage reflects all aspects of Earth science, whether the perspective be research or policy.

Conference organisers are welcome to visit conferenceseries.iop.org, or e-mail ees@iop.org, for details.



M Lin
Harvard University,
USA

Reckoning wheat yield trends

M Lin and P Huybers

2012 *Environ. Res. Lett.* **7** 024016

Wheat yields have increased approximately linearly since the mid-twentieth century across the globe, but stagnation of these trends has now been suggested for several nations. We present a new statistical test for whether a yield time series has leveled off and apply it to wheat yield data from 47 different regions to show that nearly half of the production within our sample has transitioned to level trajectories. With the major exception of India, the majority of leveling in wheat yields occurs within developed nations—including the United Kingdom, France and Germany—whose policies appear to have disincentivized yield increases relative to other objectives. The effects of climate change and of yields nearing their maximum potential may also be important.



Featured on *environmentalresearchweb*

Wheat yields are levelling off, even in some developing countries

environmentalresearchweb.org/cws/article/news/49901



Richard K F Unsworth
Swansea University,
UK

Tropical seagrass meadows modify seawater carbon chemistry: implications for coral reefs impacted by ocean acidification

Richard K F Unsworth, Catherine J Collier, Gideon M Henderson and Len J McKenzie

2012 *Environ. Res. Lett.* **7** 024026

Highly productive tropical seagrasses often live adjacent to or among coral reefs and utilize large amounts of inorganic carbon. We model the effect of seagrass productivity on seawater carbonate chemistry and coral calcification. Published data reveal that seagrass meadows in the Indo-Pacific have an 83% chance of being net autotrophic, resulting in an average net sink of $155 \text{ gC m}^{-2} \text{ yr}^{-1}$. Analysis on seawater carbonate chemistry indicate that increases in pH of up to 0.38 units, and Ω_{arag} increases of 2.9 are possible in the presence of seagrass with the precise values of these increases dependent on water residence time (tidal flushing) and water depth. In shallow water reef environments, Scleractinian coral calcification downstream of seagrass has the potential to be $\approx 18\%$ greater than in an environment without seagrass, possibly offering a potential tool in local marine park management. The applicability of this will depend upon local physical conditions as well as the spatial configuration of habitats, and the factors that influence their productivity. This novel study suggests that seagrass meadows may enhance coral reef resilience to future ocean acidification.



Featured on *environmentalresearchweb*

Seagrass to the rescue?

environmentalresearchweb.org/cws/article/news/50288



Julia Pongratz
Max Planck Institute
for Meteorology,
Germany



**VIDEO
ABSTRACT**

Attribution of atmospheric CO₂ and temperature increases to regions: importance of preindustrial land use change

Julia Pongratz and Ken Caldeira

2012 *Environ. Res. Lett.* **7** 034001

The historical contribution of each country to today's observed atmospheric CO₂ excess and higher temperatures has become a basis for discussions around burden-sharing of greenhouse gas reduction commitments in political negotiations. However, the accounting methods have considered greenhouse gas emissions only during the industrial era, neglecting the fact that land use changes (LUC) have caused emissions long before the Industrial Revolution. Here, we hypothesize that considering preindustrial LUC affects the attribution because the geographic pattern of preindustrial LUC emissions differs significantly from that of industrial-era emissions and because preindustrial emissions have legacy effects on today's atmospheric CO₂ concentrations and temperatures. We test this hypothesis by estimating CO₂ and temperature increases based on carbon cycle simulations of the last millennium. We find that accounting for preindustrial LUC emissions results in a shift of attribution of global temperature increase from the industrialized countries to less industrialized countries, in particular South Asia and China, by up to 2–3%, a level that may be relevant for political discussions. While further studies are needed to span the range of plausible quantifications, our study demonstrates the importance of including preindustrial emissions for the most scientifically defensible attribution.

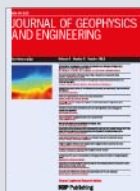


Featured on *environmentalresearchweb*

Early land clearance boosts Chinese and Indian emissions

environmentalresearchweb.org/cws/article/news/50135

JOURNAL OF GEOPHYSICS AND ENGINEERING



Journal of Geophysics and Engineering promotes research and developments in geophysics and related areas of engineering. It has a predominantly applied science and engineering focus, but solicits and accepts high-quality contributions in all earth-physics disciplines, including geodynamics, natural and controlled-source seismology, oil, gas and mineral exploration, petrophysics and reservoir geophysics. The journal covers those aspects of engineering that are closely related to geophysics, or on the targets and problems that geophysics addresses. Typically, this is engineering focused on the subsurface, particularly petroleum engineering, rock mechanics, geophysical software engineering, drilling technology, remote sensing, instrumentation and sensor design.

For more information visit iopscience.org/jge or e-mail jge@iop.org.



Jonathan Day
University of Reading,
UK



**VIDEO
ABSTRACT**

Sources of multi-decadal variability in Arctic sea ice extent

J J Day, J C Hargreaves, J D Annan and A Abe-Ouchi

2012 *Environ. Res. Lett.* **7** 034011

Though there is qualitative agreement between observations and modelling of decreasing September sea ice extent (SIE), it is concerning that the observed trend (1979–2010) is not captured by any CMIP3 ensemble member. Potential sources of this discrepancy include: observational uncertainty, physical model limitations and vigorous natural climate variability. The latter has received less attention and is difficult to assess using the relatively short observational sea ice records. In this study multi-centennial pre-industrial control simulations with five CMIP3 climate models are used to investigate the role that the Arctic oscillation (AO), the Atlantic multi-decadal oscillation (AMO) and the Atlantic meridional overturning circulation (AMOC) play in decadal sea ice variability. Further, we use the models to determine the impact that these sources of variability have had on SIE over both the era of satellite observation (1979–2010) and an extended observational record (1953–2010). There is little evidence of a relationship between the AO and SIE in the models. However, we find that both the AMO and AMOC indices are significantly correlated with SIE in all the models considered. We attribute 0.5–3.1%/decade of the 10.1%/decade decline in September SIE (1979–2010) to AMO driven variability.



Featured on *environmentalresearchweb*

One-third of Arctic sea-ice retreat could be due to natural variability

environmentalresearchweb.org/cws/article/news/50436



Erik Behrens
Helmholtz Centre for
Ocean Research Kiel,
Germany



**VIDEO
ABSTRACT**

Model simulations on the long-term dispersal of ^{137}Cs released into the Pacific Ocean off Fukushima

Erik Behrens, Franziska U Schwarzkopf, Joke F Lübbecke and Claus W Böning

2012 *Environ. Res. Lett.* **7** 034004

A sequence of global ocean circulation models are used to estimate the long-term dispersion by ocean currents and mesoscale eddies of a slowly decaying tracer from the local waters off the Fukushima Dai-ichi Nuclear Power Plants. The tracer was continuously injected into the coastal waters over some weeks; its subsequent spreading and dilution in the Pacific Ocean was then simulated for 10 years. The simulations do not include any data assimilation, and thus, do not account for the actual state of the local ocean currents during the release of highly contaminated water from the damaged plants in March–April 2011. After 2–3 years the tracer cloud has penetrated to depths of more than 400 m, spanning the western and central North Pacific with rapid dilution of concentrations. The rate of dilution declines in the following years, while the main tracer patch propagates eastward across the Pacific Ocean, reaching the coastal waters of North America after

about 5–6 years. After 4–7 years, rapid dilution of peak radioactivity values suggested by the simulation result in total peak radioactivity levels which would then still be about twice the pre-Fukushima values.



Featured on *environmentalresearchweb*

Fukushima radiation could reach US coast in five years

environmentalresearchweb.org/cws/article/news/50176



Justin McClellan
Aurora Flight Science
Corporation, USA



David W Keith
Harvard University,
USA



Jay Apt
Carnegie Mellon
University, USA

Cost analysis of stratospheric albedo modification delivery systems

Justin McClellan, David W Keith and Jay Apt

2012 *Environ. Res. Lett.* **7** 034019

We perform engineering cost analyses of systems capable of delivering 1–5 million metric tonnes (Mt) of albedo modification material to altitudes of 18–30 km. The goal is to compare a range of delivery systems evaluated on a consistent cost basis. Cost estimates are developed with statistical cost estimating relationships based on historical costs of aerospace development programs and operations concepts using labor rates appropriate to the operations. We evaluate existing aircraft cost of acquisition and operations, perform in-depth new aircraft and airship design studies and cost analyses, and survey rockets, guns, and suspended gas and slurry pipes, comparing their costs to those of aircraft and airships. Annual costs for delivery systems based on new aircraft designs are estimated to be \$1–3B to deliver 1 Mt to 20–30 km or \$2–8B to deliver 5 Mt to the same altitude range. Costs for hybrid airships may be competitive, but their large surface area complicates operations in high altitude wind shear, and development costs are more uncertain than those for airplanes. Pipes suspended by floating platforms provide low recurring costs to pump a liquid or gas to altitudes as high as ~ 20 km, but the research, development, testing and evaluation costs of these systems are high and carry a large uncertainty; the pipe system's high operating pressures and tensile strength requirements bring the feasibility of this system into question. The costs for rockets and guns are significantly higher than those for other systems. We conclude that (a) the basic technological capability to deliver material to the stratosphere at million tonne per year rates exists today, (b) based on prior literature, a few million tonnes per year would be sufficient to alter radiative forcing by an amount roughly equivalent to the growth of anticipated greenhouse gas forcing over the next half century, and that (c) several different methods could possibly deliver this quantity for less than \$8B per year. We do not address here the science of aerosols in the stratosphere, nor issues of risk, effectiveness or governance that will add to the costs of solar geoengineering.



Featured on *environmentalresearchweb*

Geoengineering 'comparatively inexpensive'

environmentalresearchweb.org/cws/article/news/50662



D R Fereday
Met Office Hadley
Centre, UK

Seasonal forecasts of northern hemisphere winter 2009/10

D R Fereday, A Maidens, A Arribas, A A Scaife and J R Knight

2012 *Environ. Res. Lett.* **7** 034031

Northern hemisphere winter 2009/10 was exceptional for atmospheric circulation: the North Atlantic Oscillation (NAO) index was the lowest on record for over a century. This contributed to cold conditions over large areas of Eurasia and North America. Here we use two versions of the Met Office GloSea4 seasonal forecast system to investigate the predictability of this exceptional winter. The first is the then operational version of GloSea4, which uses a low top model and successfully predicted a negative NAO in forecasts produced in September, October and November 2009. The second uses a new high top model, which better simulates sudden stratospheric warmings (SSWs). This is particularly relevant for 2009/10 due to its unusual combination of a strong El Niño and an easterly quasi-biennial oscillation (QBO) phase, favouring SSW development. SSWs are shown to play an influential role in surface conditions, producing a stronger sea level pressure signal and improving predictions of the 2009/10 winter.



Featured on *environmentalresearchweb*

'High-top' forecasting predicts cold winters more accurately

environmentalresearchweb.org/cws/article/news/50833



Michael E Webber
The University of
Texas at Austin, USA

Evaluating the energy consumed for water use in the United States

Kelly T Sanders and Michael E Webber

2012 *Environ. Res. Lett.* **7** 034034

This letter consists of a first-order analysis of the primary energy embedded in water in the United States. Using a combination of top-down sectoral assessments of energy use together with a bottom-up allocation of energy-for-water on a component-wise and service-specific level, our analysis concludes that energy use in the residential, commercial, industrial and power sectors for direct water and steam services was approximately 12.3 ± 0.3 quadrillion BTUs or 12.6% of the 2010 annual primary energy consumption in the United States. Additional energy was used to generate steam for indirect process heating, space heating and electricity generation.



**VIDEO
ABSTRACT**



Featured on *environmentalresearchweb*

Can using water wisely trump better lighting?

environmentalresearchweb.org/cws/article/news/50935



Philippe Huybrechts
Vrije Universiteit
Brussel, Belgium

Millennial total sea-level commitments projected with the Earth system model of intermediate complexity LOVECLIM

H Goelzer, P Huybrechts, S C B Raper, M-F Loutre, H Goosse and T Fichet

2012 *Environ. Res. Lett.* **7** 045401

Sea-level is expected to rise for a long time to come, even after stabilization of human-induced climatic warming. Here we use simulations with the Earth system model of intermediate complexity LOVECLIM to project sea-level changes over the third millennium forced with atmospheric greenhouse gas concentrations that stabilize by either 2000 or 2100 AD. The model includes 3D thermomechanical models of the Greenland and Antarctic ice sheets coupled to an atmosphere and an ocean model, a global glacier melt algorithm to account for the response of mountain glaciers and ice caps, and a procedure for assessing oceanic thermal expansion from oceanic heat uptake. Four climate change scenarios are considered to determine sea-level commitments. These assume a 21st century increase in greenhouse gases according to SRES scenarios B1, A1B and A2 with a stabilization of the atmospheric composition after the year 2100. One additional scenario assumes 1000 years of constant atmospheric composition from the year 2000 onwards. For our preferred model version, we find an already committed total sea-level rise of 1.1 m by 3000 AD. In experiments with greenhouse gas concentration stabilization at 2100 AD, the total sea-level rise ranges between 2.1 m (B1), 4.1 m (A1B) and 6.8 m (A2). In all scenarios, more than half of this amount arises from the Greenland ice sheet, thermal expansion is the second largest contributor, and the contribution of glaciers and ice caps is small as it is limited by the available ice volume of maximally 25 cm of sea-level equivalent. Additionally, we analysed the sensitivity of the sea-level contributions from an ensemble of nine different model versions that cover a large range of climate sensitivity realized by model parameter variations of the atmosphere–ocean model. Selected temperature indices are found to be good predictors for sea-level contributions from the different components of land ice and oceanic thermal expansion after 1000 years.



Featured on [environmentalresearchweb](http://environmentalresearchweb.org)

Sea-level rise could approach seven metres by year 3000

environmentalresearchweb.org/cws/article/news/51023



Did you know?

Each ERL article averages
1400 downloads within
six months of publication



High visibility

More than **60,000 article**
downloads per month



James Painter
University of Oxford,
UK

Cross-national comparison of the presence of climate scepticism in the print media in six countries, 2007–10

James Painter and Teresa Ashe

2012 *Environ. Res. Lett.* **7** 044005

Previous academic research on climate scepticism has tended to focus more on the way it has been organized, its tactics and its impact on policy outputs than on its prevalence in the media. Most of the literature has centred on the USA, where scepticism first appeared in an organized and politically effective form. This letter contrasts the way climate scepticism in its different forms is manifested in the print media in the USA and five other countries (Brazil, China, France, India and the UK), in order to gain insight into how far the US experience of scepticism is replicated in other countries. It finds that news coverage of scepticism is mostly limited to the USA and the UK; that there is a strong correspondence between the political leaning of a newspaper and its willingness to quote or use uncontested sceptical voices in opinion pieces; and that the type of sceptics who question whether global temperatures are warming are almost exclusively found in the US and UK newspapers. Sceptics who challenge the need for robust action to combat climate change also have a much stronger presence in the media of the same two countries.



Featured on *environmentalresearchweb*

Media in US and UK give climate scepticism more voice

environmentalresearchweb.org/cws/article/news/51048



Fast publication and high impact

Average submission-to-acceptance time within **75 days**

The Impact Factor for 2011 is **3.631**



Media coverage

ERL articles regularly feature in high-profile media outlets such as the *New York Times*, the *Guardian*, the BBC and *Scientific American*



Eric A Davidson
The Woods Hole
Research Center,
USA

Representative concentration pathways and mitigation scenarios for nitrous oxide

Eric A Davidson

2012 *Environ. Res. Lett.* **7** 024005

The challenges of mitigating nitrous oxide (N_2O) emissions are substantially different from those for carbon dioxide (CO_2) and methane (CH_4), because nitrogen (N) is essential for food production, and over 80% of anthropogenic N_2O emissions are from the agricultural sector. Here I use a model of emission factors of N_2O to demonstrate the magnitude of improvements in agriculture and industrial sectors and changes in dietary habits that would be necessary to match the four representative concentration pathways (RCPs) now being considered in the fifth assessment report (AR5) of the Intergovernmental Panel on Climate Change (IPCC). Stabilizing atmospheric N_2O by 2050, consistent with the most aggressive of the RCP mitigation scenarios, would require about 50% reductions in emission factors in all sectors and about a 50% reduction in mean per capita meat consumption in the developed world. Technologies exist to achieve such improved efficiencies, but overcoming social, economic, and political impediments for their adoption and for changes in dietary habits will present large challenges.



Featured on *environmentalresearchweb*

Call for less meat-eating to cut nitrous oxide

environmentalresearchweb.org/cws/article/news/49269



Antonello Pasini
CNR Rome, Italy

Evidence of recent causal decoupling between solar radiation and global temperature

Antonello Pasini, Umberto Triacca and Alessandro Attanasio

2012 *Environ. Res. Lett.* **7** 034020

The Sun has surely been a major external forcing to the climate system throughout the Holocene. Nevertheless, opposite trends in solar radiation and temperatures have been empirically identified in the last few decades. Here, by means of an inferential method—the Granger causality analysis—we analyze this situation and, for the first time, show that an evident causal decoupling between total solar irradiance and global temperature has appeared since the 1960s.



Featured on *environmentalresearchweb*

Sun swung from influence in '60s

environmentalresearchweb.org/cws/article/news/50962

Featured article



Stefan Rahmstorf
Potsdam Institute
for Climate Impact
Research, Germany

Comparing climate projections to observations up to 2011

Stefan Rahmstorf, Grant Foster and Anny Cazenave

2012 *Environ. Res. Lett.* **7** 044035

Abstract

We analyse global temperature and sea-level data for the past few decades and compare them to projections published in the third and fourth assessment reports of the Intergovernmental Panel on Climate Change (IPCC). The results show that global temperature continues to increase in good agreement with the best estimates of the IPCC, especially if we account for the effects of short-term variability due to the El Niño/Southern Oscillation, volcanic activity and solar variability. The rate of sea-level rise of the past few decades, on the other hand, is greater than projected by the IPCC models. This suggests that IPCC sea-level projections for the future may also be biased low.

Media coverage

- *The Guardian*
US coastal cities in danger as sea levels rise faster than expected, study warns
www.guardian.co.uk/environment/2012/nov/28/us-coastal-cities-sea-level-rise
- *New Scientist*
Projections of sea level rise are vast underestimates
www.newscientist.com/article/dn22561-projections-of-sea-level-rise-are-vast-underestimates.html
- *The Huffington Post*
Sea level rise accelerating faster than initial projections
www.huffingtonpost.com/2012/11/28/sea-level-rise-2012-rising_n_2204402.html

Sea level rising faster than IPCC projected

Stefan Rahmstorf and colleagues talk to ERL's sister community website, [environmentalresearchweb](http://environmentalresearchweb.org), about their latest research in ERL.

Sea level is rising 60% faster than the IPCC fourth assessment projected. That is according to researchers from Germany, the US and France who have looked at satellite data for the last 20 years. "Global sea level is rising significantly faster than expected," Stefan Rahmstorf of the Potsdam Institute for Climate Impact Research told *environmentalresearchweb*. "This is of some concern, because of the large impacts of sea-level rise and because this suggests that sea-level projections for the future might be biased low."

The team did find, however, that global temperature continues to rise at the rate projected in the last two IPCC reports. "The data put to rest a misconception popular in some quarters, that global warming has slowed down or is lagging behind the projections," said Rahmstorf. "That is not the case." Together with colleagues from Tempo Analytics, US, and Laboratoire d'Etudes en Géophysique et Océanographie Spatiales, France, Rahmstorf analysed global temperature and sea-level data from the past two decades. The researchers used averages from the five available global land-and-ocean temperature series. Removing the three phenomena known to cause short-term variability in global temperatures – solar variations, volcanic aerosols and El Niño – gave an overall warming trend of 0.16 °C per decade.

"It is important to properly analyse current climatic trends in the peer-reviewed literature, and to compare the observations to projections that have been made in the past," said Rahmstorf. "This helps to illuminate possible shortcomings in those projections and to improve future projections."



To read the story in full on *environmentalresearchweb*, go to environmentalresearchweb.org/cws/article/news/51673



Monthly highlights

Stay up to date with a selection of the very best new content from ERL. Sign up for our monthly highlights by e-mailing erl@iop.org.



Twitter

Follow us on Twitter
[@IOPenvironment](https://twitter.com/IOPenvironment)



H Damon Matthews
Concordia University,
Canada

Observed decreases in the Canadian outdoor skating season due to recent winter warming

Nikolay N Damyanov, H Damon Matthews and Lawrence A Mysak

2012 *Environ. Res. Lett.* **7** 014028

Global warming has the potential to negatively affect one of Canada's primary sources of winter recreation: hockey and ice skating on outdoor rinks. Observed changes in winter temperatures in Canada suggest changes in the meteorological conditions required to support the creation and maintenance of outdoor skating rinks; while there have been observed increases in the ice-free period of several natural water bodies, there has been no study of potential trends in the duration of the season supporting the construction of outdoor skating rinks. Here we show that the outdoor skating season (OSS) in Canada has significantly shortened in many regions of the country as a result of changing climate conditions. We first established a meteorological criterion for the beginning, and a proxy for the length of the OSS. We extracted this information from daily maximum temperature observations from 1951 to 2005, and tested it for significant changes over time due to global warming as well as due to changes in patterns of large-scale natural climate variability. We found that many locations have seen a statistically significant decrease in the OSS length, particularly in Southwest and Central Canada. This suggests that future global warming has the potential to significantly compromise the viability of outdoor skating in Canada.



Featured on *environmentalresearchweb*

Warming climate is bad news for Canadian outdoor skating

environmentalresearchweb.org/cws/article/news/49077



J Elliott Campbell
University of
California, Merced,
USA

Terrestrial carbon losses from mountaintop coal mining offset regional forest carbon sequestration in the 21st century

J Elliott Campbell, James F Fox and Peter M Acton

2012 *Environ. Res. Lett.* **7** 045701

Studies that quantify the spatial and temporal variability of carbon sources and sinks provide process-level information for the prediction of future levels of atmospheric carbon dioxide as well as verification of current emission agreements. Assessments of carbon sources and sinks for North America that compare top-down atmospheric constraints with bottom-up inventories find particularly large carbon sinks in the southeastern US. However, this southeastern US sink may be impacted by extreme land-use disturbance events due to mountaintop coal mining (MCM). Here we apply ecosystem modeling and field experiment data to quantify the potential impact of future mountaintop coal mining on the carbon budget of the southern Appalachian forest region. For projections based on

historical mining rates, grassland reclamation, and the continued regrowth of un-mined forests, we find that the southern Appalachian forests switch from a net carbon sink to a net carbon source by year 2025–33 with a 30%–35% loss in terrestrial carbon stocks relative to a scenario with no future mining by the year 2100. Alternatively, scenarios of forest sequestration due to the effect of CO₂ fertilization result in a 15%–24% loss in terrestrial carbon stocks by the year 2100 for mining scenarios relative to scenarios with no future mining. These results suggest that while power plant stack emissions are the dominant life-cycle stage in coal-fired electricity, accounting for mountaintop coal mining in bottom-up inventories may be a critical component of regional carbon budgets.



Edward D Frank
Argonne National
Laboratory, USA

Methane and nitrous oxide emissions affect the life-cycle analysis of algal biofuels

Edward D Frank, Jeongwoo Han, Ignasi Palou-Rivera, Amgad Elgowainy and Michael Q Wang

2012 *Environ. Res. Lett.* **7** 014030

Researchers around the world are developing sustainable plant-based liquid transportation fuels (biofuels) to reduce petroleum consumption and greenhouse gas emissions. Algae are attractive because they promise large yields per acre compared to grasses, grains and trees, and because they produce oils that might be converted to diesel and gasoline equivalents. It takes considerable energy to produce algal biofuels with current technology; thus, the potential benefits of algal biofuels compared to petroleum fuels must be quantified. To this end, we identified key parameters for algal biofuel production using GREET, a tool for the life-cycle analysis of energy use and emissions in transportation systems. The baseline scenario produced 55 400 g CO₂ equivalent per million BTU of biodiesel compared to 101 000 g for low-sulfur petroleum diesel. The analysis considered the potential for greenhouse gas emissions from anaerobic digestion processes commonly used in algal biofuel models. The work also studied alternative scenarios, e.g., catalytic hydrothermal gasification, that may reduce these emissions. The analysis of the nitrogen recovery step from lipid-extracted algae (residues) highlighted the importance of considering the fate of the unrecovered nitrogen fraction, especially that which produces N₂O, a potent greenhouse gas with global warming potential 298 times that of CO₂.



Featured on [environmentalresearchweb](http://environmentalresearchweb.org)
Algal biofuels beat diesel on greenhouse emissions
environmentalresearchweb.org/cws/article/news/49118



Hashem Akbari
Concordia University,
Canada

The long-term effect of increasing the albedo of urban areas

Hashem Akbari, H Damon Matthews and Donny Seto

2012 *Environ. Res. Lett.* **7** 024004

Solar reflective urban surfaces (white rooftops and light-colored pavements) can increase the albedo of an urban area by about 0.1. Increasing the albedo of urban and human settlement areas can in turn decrease atmospheric temperature and could potentially offset some of the anticipated temperature increase caused by global warming. We have simulated the long-term (decadal to centennial) effect of increasing urban surface albedos using a spatially explicit global climate model of intermediate complexity. We first carried out two sets of simulations in which we increased the albedo of all land areas between $\pm 20^\circ$ and $\pm 45^\circ$ latitude respectively. The results of these simulations indicate a long-term global cooling effect of 3×10^{-15} K for each 1 m^2 of a surface with an albedo increase of 0.01. This temperature reduction corresponds to an equivalent CO_2 emission reduction of about 7 kg, based on recent estimates of the amount of global warming per unit CO_2 emission. In a series of additional simulations, we increased the albedo of urban locations only, on the basis of two independent estimates of the spatial extent of urban areas. In these simulations, global cooling ranged from 0.01 to 0.07 K, which corresponds to a CO_2 equivalent emission reduction of 25–150 billion tonnes of CO_2 .



Featured on *environmentalresearchweb*

Cool cities could help fight climate change

environmentalresearchweb.org/cws/article/news/49268



Sergey Paltsev
Massachusetts
Institute of
Technology, USA

Shale gas production: potential versus actual greenhouse gas emissions

Francis O'Sullivan and Sergey Paltsev

2012 *Environ. Res. Lett.* **7** 044030

Estimates of greenhouse gas (GHG) emissions from shale gas production and use are controversial. Here we assess the level of GHG emissions from shale gas well hydraulic fracturing operations in the United States during 2010. Data from each of the approximately 4000 horizontal shale gas wells brought online that year are used to show that about 900 Gg CH_4 of potential fugitive emissions were generated by these operations, or 228 Mg CH_4 per well—a figure inappropriately used in analyses of the GHG impact of shale gas. In fact, along with simply venting gas produced during the completion of shale gas wells, two additional techniques are widely used to handle these potential emissions: gas flaring and reduced emission 'green' completions. The use of flaring and reduced emission completions reduce the levels of actual fugitive emissions from shale well completion operations to about 216 Gg CH_4 , or 50 Mg CH_4 per well, a release

substantially lower than several widely quoted estimates. Although fugitive emissions from the overall natural gas sector are a proper concern, it is incorrect to suggest that shale gas-related hydraulic fracturing has substantially altered the overall GHG intensity of natural gas production.



Featured on *environmentalresearchweb*

Shale-gas emissions during fracking only a quarter of potential amount
environmentalresearchweb.org/cws/article/news/51943



Vanessa Jine Schweizer
 National Center
 for Atmospheric
 Research, USA

Improving environmental change research with systematic techniques for qualitative scenarios

Vanessa Jine Schweizer and Elmar Kriegler

2012 *Environ. Res. Lett.* **7** 044011



Elmar Kriegler
 Potsdam Institute
 for Climate Impact
 Research, Germany

Scenarios are key tools in analyses of global environmental change. Often they consist of quantitative and qualitative components, where the qualitative aspects are expressed in narrative, or storyline, form. Fundamental challenges in scenario development and use include identifying a small set of compelling storylines that span a broad range of policy-relevant futures, documenting that the assumptions embodied in the storylines are internally consistent, and ensuring that the selected storylines are sufficiently comprehensive, that is, that descriptions of important kinds of future developments are not left out. The dominant approach to scenario design for environmental change research has been criticized for lacking sufficient means of ensuring that storylines are internally consistent. A consequence of this shortcoming could be an artificial constraint on the range of plausible futures considered. We demonstrate the application of a more systematic technique for the development of storylines called the cross-impact balance (CIB) method. We perform a case study on the scenarios published in the IPCC Special Report on Emissions Scenarios (SRES), which are widely used. CIB analysis scores scenarios in terms of internal consistency. It can also construct a very large number of scenarios consisting of combinations of assumptions about individual scenario elements and rank these combinations in terms of internal consistency. Using this method, we find that the four principal storylines employed in the SRES scenarios vary widely in internal consistency. One type of storyline involving highly carbon-intensive development is underrepresented in the SRES scenario set. We conclude that systematic techniques like CIB analysis hold promise for improving scenario development in global change research.



**VIDEO
 ABSTRACT**



Featured on *environmentalresearchweb*

Energy system may be heading for higher emission scenarios
environmentalresearchweb.org/cws/article/news/51584



Tobias Böhmelt
ETH Zurich,
Switzerland

Environmental changes and violent conflict

Thomas Bernauer, Tobias Böhmelt and Vally Koubi

2012 *Environ. Res. Lett.* **7** 015601

This letter reviews the scientific literature on whether and how environmental changes affect the risk of violent conflict. The available evidence from qualitative case studies indicates that environmental stress can contribute to violent conflict in some specific cases. Results from quantitative large-N studies, however, strongly suggest that we should be careful in drawing general conclusions. Those large-N studies that we regard as the most sophisticated ones obtain results that are not robust to alternative model specifications and, thus, have been debated. This suggests that environmental changes may, under specific circumstances, increase the risk of violent conflict, but not necessarily in a systematic way and unconditionally. Hence there is, to date, no scientific consensus on the impact of environmental changes on violent conflict. This letter also highlights the most important challenges for further research on the subject. One of the key issues is that the effects of environmental changes on violent conflict are likely to be contingent on a set of economic and political conditions that determine adaptation capacity. In the authors' view, the most important indirect effects are likely to lead from environmental changes via economic performance and migration to violent conflict.



Featured on *environmentalresearchweb*

Climate change not linked to violent conflict

environmentalresearchweb.org/cws/article/news/48393

JOURNAL TEAM

Our dedicated *Environmental Research Letters* team at IOP Publishing is here to ensure the peer-review and production processes run as smoothly as possible for our authors.



Guillaume Wright
Publisher



Evie Palmer
Senior Marketing
Executive



Amy Harvey
Production Editor



Kryssa Roycroft
Publishing
Administrator



Liz Kalaugher
Editor
environmentalresearchweb

ERL is evolving

We won't just publish your work;
we will help you share your research
with others in new and innovative ways.

The less formal format of the video abstracts allows the authors to phrase their message in a clear and personal way. Together with the additional audio-visual dimension, the videos bridge the gap between the technical article and a broad audience.

Julia Pongratz,
Max Planck Institute for
Meteorology



With an ERL video abstract you can:

- showcase your research
- engage with your community
- raise your visibility
- make an impact

By including a video abstract you can enhance the visibility of your article by 50%. In 2012, ERL articles with video abstracts were downloaded on average more than 2000 times each.

To see the latest videos abstracts and for more information visit erl.iop.org and select 'Video abstracts'.



Focus issues

Focus issues are invited collections serving to highlight the exciting work conducted in specific areas of interest or emerging topics as identified by the Editorial board. All contributions are completely free to read.

As well as our most recent ongoing focus issues below, a full list of all completed focus issues published in the journal can be found by visiting erl.iop.org and selecting 'Focus issues' from the right-hand list.



Second Generation Biofuels and Sustainability

Guest Editors: Jason Hill, Essel Ben Hagan, Daniel Kammen and José Goldemberg

The purpose of this issue is to consolidate the knowledge, concerns and other thoughts on the production and utilization of second generation biofuels.



Electricity, Water and Climate Connections

Guest Editors: Virginia Burkett, Peter Frumhoff, Robert Jackson, Robin Newmark, Jonathan Overpeck and Michael Webber

This issue focuses on the electricity–water–climate connection, particularly water use in the power sector and under a divergent range of electricity and water-supply scenarios.



Extreme Events and the Carbon Cycle

Guest Editors: Philippe Ciais, Elise Pendall and Chuixiang Yi

The purpose of this focus issue is to address the impacts of extreme events on terrestrial carbon dynamics. The results covered by this issue are based on field observations, forest inventories, remote sensing time series, numerical modelling, theoretical and experimental approaches.



Biodiversity, Human Health and Well-Being

Guest Editors: Carolyn Stephens and Renato Athias

The critical importance of biodiversity and ecosystem services for sustainable development and current and future human well-being, particularly linked to poverty eradication, has been acknowledged. This focus issue calls for interdisciplinary research on this vital theme.



Environmental Risks and Migration: Causes and Consequences

Guest Editors: Neil Adger, Richard Black, Nigel Arnell, Stefan Dercon, David Thomas, Andrew Geddes and Lori Hunter

This issue focuses on environmental change with input from demographic theory with a framework of existing trends of mobility, urbanisation and transitions, particularly on aspects of mobility, migration and the role of environmental change at global and regional scales.

Editorial board

Editor-in-Chief

Daniel M Kammen *University of California, Berkeley, USA*

Executive board

Myles Allen *University of Oxford, UK*

Maohong Fan *University of Wyoming, USA*

Peter H Gleick *The Pacific Institute, USA*

José Goldemberg *Universidade de São Paulo, Brazil*

Giles Harrison *University of Reading, UK*

Tracey Holloway *University of Wisconsin-Madison, USA*

Klaus Keller *Pennsylvania State University, USA*

Jakob Mann *Technical University of Denmark, Denmark*

Brian O'Neill *National Center for Atmospheric Research, USA*

Stefan Rahmstorf *Potsdam University, Germany*

Advisory board

Jonas Åkerman *Lund University, Sweden*

Morgan Bazilian *National Renewable Energy Laboratory, USA*

Michelle L Bell *Yale University, USA*

Isabella Bovolo *University of Newcastle upon Tyne, UK*

Geir Sverre Braut *Norwegian Board of Health Supervision, Norway*

Ben Brock *Northumbria University, UK*

Ian Colbeck *University of Essex, UK*

Felix Creutzig *Mercator Research Institute on Global Commons and Climate Change, Germany*

Majid Ezzati *Imperial College London, UK*

Congbin Fu *Chinese Academy of Sciences, Beijing, People's Republic of China*

Weijun Gao *University of Kitakyushu, Japan*

Kelly Sims Gallagher *Tufts University, USA*

Holly Gibbs *University of Wisconsin-Madison, USA*

Scott Goetz *Woods Hole Research Center, USA*

Essel Ben Hagan *Accra Institute of Technology, Ghana*

Julie Hall *National Institute of Water & Atmospheric Research, New Zealand*

Susanna Hecht *University of California, Los Angeles, USA*

Jason Hill *University of Minnesota, USA*

Arpad Horvath *University of California, Berkeley, USA*

Beate Liepert *Northwest Research Associates, USA*

David Lobell *Stanford University, USA*

Coleen Moloney *University of Cape Town, South Africa*

Mark New *University of Cape Town, South Africa*

N H Ravidranath *Indian Institute of Science – Bangalore, India*

Johan Rockström *University of Stockholm, Sweden*

Daniel Rubenstein *Princeton University, USA*

Bridget Scanlon *University of Texas, Austin, USA*

Steven Sherwood *University of New South Wales, Australia*

Carolyn Stephens *Universidad Nacional de Tucumán, Argentina*

Graeme Stephens *Colorado State University, USA*

Pascal Vittoz *Universite de Lausanne, Switzerland*

Michael Webber *University of Texas, Austin, USA*

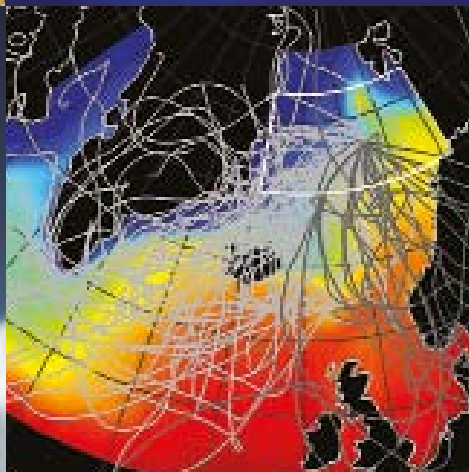
Chuixiang Yi *Queens College, City University of New York, USA*

environmentalresearchweb

environmentalresearchweb is a unique resource for the entire environmental science community. The site provides news, analysis and commentary on all areas of environmental research, including policy and sustainable technology.

Sign up to our weekly news alert at **environmentalresearchweb.org**.

All authors of ERL papers receive the opportunity to promote their work to a broader audience via *environmentalresearchweb*, either through a news story or an Insight article.



environmentalresearchweb.org

Reasons to submit to Environmental Research Letters

Impact Factor

The Impact Factor for 2011 is **3.631** (as listed in the 2011 Journal Citation Reports, Thomson Reuters 2012)[®].

High downloads

Each article averages **1400 downloads** within six months of publication.

High visibility

More than **60,000 article downloads** per month. Potential further exposure via a commissioned commentary-style 'Perspective' article, written by an expert in the field.

Fast publication

Average submission to acceptance time within **75 days**.

Media coverage

ERL continues to build on its reputation for publishing cutting-edge research of outstanding quality in an open access environment. Articles regularly feature in high-profile media outlets such as the *New York Times*, the *Guardian*, the BBC and *Scientific American*.

New and improved services

- Video abstracts
- Enhanced full-text article HTML
- Article-level metrics, including downloads, citations, shares and bookmarks
- Creative Commons CC-BY 3.0 licence compliant

Coverage on environmentalresearchweb

Exposure for your article to nearly **10,000 registered members** of our sister community website and inclusion in the weekly newswire.

Publish all of your data at no extra cost

Publication of supplementary information and data at no additional cost.



We would like to thank all of our authors, referees,
board members and supporters across the world for
their vital contribution to the work and progress of
Environmental Research Letters and *environmentalresearchweb*.

IOP Publishing

Temple Circus, Temple Way, Bristol BS1 6HG, UK

E-mail erl@iop.org Web erl.iop.org