

Met Society committee member Prof JAMES RENWICK was recently honoured with the 2018 Prime Minister's Prize for Science Communication

see

<https://www.pmscienceprizes.org.nz/previous-winners/2018-prime-ministers-science-communication-prize-winner/>

New Zealand weather and climate news

MetService focus

Weather: 'Exceptional' heavy rain, gales, floods set to slam New Zealand

"A change is coming for many this week, as a cold front moves over the South Island and lower North Island," says MetService meteorologist Rob Kerr.

Heavy rain in South Island a 'significant weather event', MetService says

MetService meteorologist Rob Kerr said this week's weather was a "significant" event, and a bit change from the calm conditions of the past week.

Watch: Wellington gusts bring down lamp post, powerlines

TVNZ

MetService meteorologist Angus Hines said winds around the city are now "pretty standard" and have reduced to 70km/h at the top of Mt Kaukau in the ...

Rain for Northland, but not the deluge set to hit rest of country

New Zealand Herald

From today significant amounts of rain are forecast for the west of the South Island, including the headwaters of the Canterbury and Otago lakes and rivers, MetService meteorologist Andy Best said.

Thick nor'west arch plunges Canterbury into dusk-like darkness

MetService meteorologist Andy Best said the latest satellite imagery showed the arch of altocumulus extended about 8000 metres up to the top of the atmosphere – the tropopause.

Tauranga in for a 'subtropical' and muggy week

New Zealand Herald

High temperatures, moist air and a week of showers will set Tauranga up for some muggy conditions this week. MetService meteorologist Andy Best ...

Dry conditions could see drought declared in Waikato

MetService meteorologist Lisa Murray said it was unlikely to rain over the next few weeks. There was a settled ridge of high pressure over the country ...

Fiordland deluge over past 24 hours could 'fill 800k Olympic-sized swimming pools' - meteorologist

The cold front currently moving up the country has mixed with warm air to produce what MetService meteorologist Lisa Murray calls a "significant" amount of rain.

Peak of West Coast downpour likely still to come

MetService senior communications meteorologist Lisa Murray told Stuff the quantity of rain expected to fall on the western slopes of the Alps by the end of Tuesday was "significant even by West Coast standards".

Coasters on clean-up duty have till Sunday before the rain returns

However, MetService head of weather communications Lisa Murray said it still had the potential to be significant.

Woman named after being killed in West Coast floodwaters as scale of destruction unfolds

The woman killed after being swept away in surging floodwaters in the Arahura Valley has been named by police.

As it happened: West Coast bridge washed away as rivers reach record levels

A state of emergency has been declared in Westland as torrential rain brings flooding to the region, with the Waiho Bridge, south of Franz Josef Glacier, totally washed away.

Dry weather cutting dairy production, boosting power costs

March 22 (BusinessDesk) - New Zealand milk production fell from year-earlier levels for the first time in 11 months in February due to dry weather.

NZ's glaciers 'sad and dirty' after third-hottest summer

New Zealand's famous glaciers are looking "sad and dirty" after another brutally warm summer, says a scientist who took part in this year's aerial stocktake.

Each year, the Niwa-led snowline survey checks the health of about 50 glaciers across the Southern Alps.

Auckland's rising seas: Insurance warning as 43,000 at risk

New data showing that more than 43,000 Aucklanders are directly threatened by rising seas has prompted warnings that home insurers may be forced in future to hike prices - or withdraw coverage altogether.

MetOcean

Evidence rogue waves are getting more extreme

Research suggests that 'rogue' waves are occurring less often, but becoming more extreme. Scientists have, for the first time, used long-term data from a wide expanse of ocean to investigate how these rare, unexpected and hazardous ocean phenomena behave.

Marine heatwave a factor in the West Coast's torrential rain

We've had the benefits of the marine heatwave - the hot summer days and warm seas. Now comes the downside - torrential rain.

Extreme weather (and other news) – Antarctica and offshore

Antarctic snowfall dominated by a few extreme snowstorms

Posted: 25 Mar 2019 09:20 AM PDT

A new study reveals the importance of a small number of intense storms around Antarctica in controlling the amount of snow falling across the continent.

Extreme weather (and other news) – Australia and Pacific

Insurance losses due to weather catastrophes hit \$2.2 billion

Insurance Business Australia

The three catastrophic events that lashed across Australia over the 2018-19 summer have resulted in more than \$2.2 billion in insurance losses, ...

Science: Australian local weather device identifies finish of winter by 2050 [Report]

Academics from the School of Art & Design have teamed up with colleagues from the ANU Climate Change Institute on a design project, which takes existing data and communicates the impacts of climate change in a way that people can engage with and better understand.

Cyclone Trevor creates wind gusts as violent as Cyclone Tracy before downgrading to tropical low

At its peak, ex-tropical Cyclone Trevor was as powerful as 1974's devastating Cyclone Tracy, with wind gusts of up to 250 kilometres per hour.

Cyclone Trevor's monster evacuation effort in Northern Territory 'almost certainly saved a life'

The biggest evacuation effort since Cyclone Tracy has seen all Territorians safely through a category four cyclone and "almost certainly saved life".

Cyclone Vance remembered 20 years after the category five system devastated Exmouth

As news broke that a ferocious cyclone — of the highest possible intensity — was heading straight towards the seaside town of Exmouth on March 22, 1999, Helen Jarvis packed a small suitcase with treasured photographs and some clothing and left behind the 10-metre caravan she called home.

Notorious weather blackspot in north-west Queensland gets green light for four new BOM radars

A notorious weather blackspot unable to retrieve river or rainfall data is set to be covered by four new radars.

Extreme weather (and other news) – Asia and the Middle East, Africa

'Simply horrendous': Cyclone death toll tops 750 in Africa

Cyclone Idai's death toll has risen above 750 in the three southern African countries hit 10 days ago by the storm, as workers restore electricity, water and try to prevent outbreak of cholera, authorities said Sunday.

Mozambique city fought climate change, but cyclone roared in

Long before Cyclone Idai roared in and tore apart Mozambique's seaside city of Beira, the mayor dreamed of protecting his people from climate change.

Photos: what Mozambique's unfolding flooding catastrophe looks like

Flooding following Cyclone Idai has left hundreds dead and more than 100,000 displaced in Mozambique, Zimbabwe, and Malawi.

Flash floods kill 17, injure at least 74 in Iran as powerful storm slams Middle East

AccuWeather.com

Residents in Fars were being told to stay in their homes. ... "Drier weather will return to the hardest-hit areas on Wednesday before the risk for rain ...

The Forces behind South and Central China's Extremely Hot Summer

EurekAlert (press release)

On July 21, 2017, a weather station in Shanghai, China recorded a high ... With observational data collected from 740 weather stations, researchers ... of Tropical Oceanography of the South China Sea Institute of Oceanology at the ...

Extreme weather (and other news) – Americas and Europe

Flood damages exceed \$1.3 billion in Nebraska as floodwaters begin to slowly recede across ...

AccuWeather.com

With the floodwaters receding in parts of Iowa and Nebraska, residents are ... While residents of Nebraska and Iowa begin cleaning up, those in in effect in the central U.S., according to the National Weather Service (NWS).

UK weather forecast: Britain to bask in sun as temperatures hit 17C, Met Office says

The Independent

Britain is set to bask in spring sunshine this week with temperatures expected to reach 17C, according to the Met Office. A band of high pressure will ...

Tropical anomaly Storm Iba swirls off Brazilian coast

The Weather Network

For the first time since 2010, a tropical storm has formed in the South Atlantic. The Brazilian Navy Hydrographic Center (BNHC) began issuing ...

International news and research

Climate changes make some aspects of weather forecasting increasingly difficult

The ongoing climate changes make it increasingly difficult to predict certain aspects of weather, according to a new study. The study, focusing on weather forecasts in the northern hemisphere spanning 3-10 days ahead, concludes that the greatest uncertainty increase will be regarding summer downfalls, of critical importance when it comes to our ability to predict and prepare for flooding.

Europe's big weather supercomputer data center is about to leave UK

ZDNet

From 2020, the data center of the European Centre for Medium-Range Weather Forecasts (ECMWF) will no longer be sited in Reading, west of ...

A Single Thundercloud Carries 1 Billion Volts of Electricity

When Benjamin Franklin tied a key to a kite and flew it into a lightning storm, he briefly became an appliance plugged into the strongest power generator on Earth.

MeteoShield Pro to be produced in Europe using advanced manufacturing technologies

openPR (press release)

The most advanced solar radiation shield for weather stations, the MeteoShield Pro, will now be produced in Europe and USA. Its manufacturing will ...

Weather Forecasting Depends On Accurate Models From A Variety of Sources

Forbes

You often hear meteorologists on television talk about various weather models, especially heading into an uncertain time period. Frequently, different ...

Florence, Michael are 'insensitive', retired as hurricane names by meteorologists

SILive.com

Including Florence and Michael, 89 Atlantic storm names have been retired since 1953, the year the World Meteorological Organization began naming ...

AI Might Be the Future for Weather Forecasting

Interesting Engineering

Weather forecasting has come a long way over the past 20 years. These kinds of satellites provide space weather alerts and forecasts whilst also ...

National Meteorological Library and Archive - Open to Everyone

Met Office (press release)

Holding one of the country's most comprehensive collections on meteorology, the library and archive are vital for maintaining the public memory of the ...

Improving weather forecasting to bring Russia significant savings

Realnoe vremya

Improving weather forecasting to bring Russia significant savings ... and systems delivering weather, climate and hydrological data and information.

Meteorologists develop better ways to measure atmosphere, thunderstorms

KFDX

... over a hundred years one of the main tools of weather forecasting and has been a weather ...
"Then the models could take the data in and we can narrow down the target areas ... Practice in the lab leads to better data in the field.

Tropical storms likely to become more deadly as climate changes

Posted: 20 Mar 2019 11:10 AM PDT

Tropical storms are likely to become more deadly under climate change, leaving people in developing countries, where there may be a lack of resources or poor infrastructure, at increased risk, new research shows.

A Cruise Ship, Bullied Meteorologists, And Overpasses - The Curious Connection

Forbes

The first of these events is the most disgusting because it continues the pathetic and perverted trend of TV meteorologists, especially women, being ...

Half a degree more warming may cause dramatic differences on drought-flood compound risks

Posted: 26 Mar 2019 07:56 AM PDT

The Paris Agreement set goals of keeping global temperature rise below 2.0°C and working to keep that rise to 1.5°C to mitigate impacts of climate change. To predict how these temperature rises will intensify the hydrologic cycle, researchers developed a new metric that reflects dry and

wet spell intensity and conducted multi-model ensemble experiments. The scenario with 0.5°C more warming showed significantly greater intensification. Disaster risks could be substantially reduced by reaching the 1.5°C target.

Researchers unveil effects of dust particles on cloud properties

Posted: 25 Mar 2019 09:20 AM PDT

Scientists have generated significant findings that highlight the impact of high-latitude dusts on the conversion of clouds' water droplets to ice -- or glaciation -- within low-level clouds in the Arctic region. These results contribute to a better understanding of factors at the land surface and how they affect cloud formations.

Forecasting What's Next for Weather Prediction

WCAI

... machine learning, more accurate climate models, and big data to improve the accuracy of forecasts. Peter Neille, the director of weather forecasting ...

Aviation

Rocket Lab set to launch US defense agency satellite today

New Zealand Herald

The Kiwi-American company hopes to launch the DARPA R3D2 from its Mahia launch pad, weather allowing after the payload met national interest ...

Automated weather observing Systems dispatched to 31 airports in Argentina

International Environmental Technology

Vaisala AviMet® Automated Weather Observing System is an airport ... AviMet helps air traffic controllers, pilots, and other aviation personnel make ...

Business/Insurance

Crop Weather Index Insurance Market: Comprehensive study explores Huge Growth in Future

Operanewsnow (press release)

A new research study from HTF MI with title Global Crop Weather Index ... upcoming technologies, industry drivers, challenges, regulatory policies, key ...

Communications/social media

What Makes People Heed A Weather Warning — Or Not?

NPR

Meteorologists had warned of severe weather a day before it struck Lee ... Meteorologists can often predict when a storm is going to hit, and yet people ...

Clouds

Clouds have moderated warming triggered by climate change

Posted: 25 Mar 2019 09:04 AM PDT

Researchers have analyzed information contained in the rings of ancient pine trees from northern Scandinavia to reveal how clouds have reduced the impact of natural phases of warmth in the past and are doing so again now to moderate the warming caused by anthropogenic climate change.

Energy and Mining

Droughts could hit aging power plants hard

Droughts will pose a much larger threat to U.S. power plants with once-through cooling systems than scientists previously suspected, a new study shows. If surface waters warm 3 degrees Celsius and river flows drop 20 percent, drought-related impacts will account for about 20 percent of all shutdowns or capacity reductions at these plants. Retrofitting the plants with recirculating cooling systems will significantly reduce their vulnerability to costly impacts from both drought and environmental regulations.

Health

Sickweather predicts a more severe allergy season for Arizona

AZ Big Media

... Sickweather, the popular illness tracking app which powers illness forecasts for IBM's Weather Company and the pharmaceutical industry, is doing.

History

June Bacon-Bercey: Pioneer for women in meteorology from Kansas

KSN-TV

She is the first African-American woman to receive a degree in meteorology. The first female television meteorologist. And the first woman and ...

Hydrology / Flooding

As flood risk spreads, prediction tech proves vital

GCN.com

Technology for flood monitoring and prediction is not cheap. ... It combines data from traditional sensors with weather related information extracted ...

Transport/roading/shipping/freight

What happened with Viking Sky – and is it safe to cruise in extreme conditions?

Telegraph.co.uk

“This situation did not happen due to [bad] weather but due to machine ... have been better to stay in the previous port until the bad weather passed.

More Dubai roads to be smart soon

gulfnews.com

... involves the installation of 116 cameras, 100 Radar Vehicle Detection Systems, 114 Bluetooth devices, and 17 Road Weather Information Systems.

Innovation and technologies (inc data and new products)

Earth Networks Announces Completion of Severe Weather Early Warning System for PAGASA

Associated Press

Initiated in 2017, and formally commissioned this week, the technology partnership between PAGASA and Earth Networks is the first of its kind in the ...

Climate change / global warming / sea level rise

IPCC is underselling climate change

Posted: 20 Mar 2019 07:20 AM PDT

A new study has revealed that the language used by the global climate change watchdog, the Intergovernmental Panel on Climate Change (IPCC), is overly conservative - and therefore the threats are much greater than the Panel's reports suggest.

Caves reveal past climate change

Caves are subterranean libraries. They hold records of past climate change, captured in stunning cave formations such as flowstones and stalagmites.

Rongoā Māori plants at risk from climate change

Some plants traditionally used in Māori medicine may become less available as a result of climate change, according to new research.

A study by Manaaki Whenua - Landcare Research and NorthTec say two of the plants at risk are kuta and kūmarahou.

Cloud seeding / Geoengineering

MWSS eyes cloud seeding

Philippine Star

MANILA, Philippines — The Metropolitan Waterworks and Sewerage System (MWSS) is recommending cloud seeding as the Angat Dam, Metro ...

Use cloud seeding as another tap

The Straits Times

One alternative source of water is cloud seeding, which has been used fairly successfully in countries such as the United States, China and the United ...

Journal and articles online

Quarterly Journal of the Royal Meteorological Society

Accepted Articles

Accepted, unedited articles published online and citable. The final edited and typeset Version of Record will appear in the future.

The coupling of deep convection with the resolved flow via the divergence of mass flux in the IFS

Sylvie Malardel, Peter Bechtold

First Published: 15 March 2019

Modulation of the Urban Boundary Layer Heat Budget by a Heat Wave

Liang Wang, Dan Li

First Published: 14 March 2019

Monitoring trends in ensemble forecast performance focusing on surface variables and high-impact events

Zied Ben Bouallègue, Linus Magnusson, Thomas Haiden, David S. Richardson

First Published: 12 March 2019

Scale interactions and anisotropy in stable boundary layers

Nikki Vercauteren, Vyacheslav Boyko, Davide Faranda, Ivana Stiperski

First Published: 12 March 2019

Convection-permitting ensembles: Challenges related to their design and use

Inger-Lise Frogner, Andrew Thomas Singleton, Morten Ødegaard Køltzow, Ulf Andrae

First Published: 11 March 2019

Meteorological Applications

Early View

Online Version of Record before inclusion in an issue

Assessment of modern hydro-meteorological hazards in a big city – identification for Warsaw

Elwira Żmudzka, Kinga Kulesza, Maciej Lenartowicz, Kamil Leziak, Artur Magnuszewski

Version of Record online: 22 March 2019

Continuous urban development significantly transforms the ecosystem in a big city. Thermal hazard (long-term occurrence of high air temperature) and urban flood hazard seem to be the key

climatic hazards of modern cities. The areas currently exposed to thermal and urban flood hazards in Warsaw were identified and assessed with respect to the hazard level. Combining thermal hazard and urban flood hazard maps resulted in a map of hydro-meteorological hazards that can be a useful tool for city planners.

Assimilation of soil moisture and temperature in the GRAPES Meso model using an ensemble Kalman filter

Lili Wang

Version of Record online: 20 March 2019

The experimental design framework.

Meteorological Applications

Accepted Articles

Accepted, unedited articles published online and citable. The final edited and typeset Version of Record will appear in the future.

Storm naming and forecast communication: A case study of Storm Doris

Andrew J. Charlton-Perez, Danica Vukadinovic Greetham, Rebecca Hemingway

First Published: 22 March 2019

Long-term effect of climate change on groundwater recharge in the Grand Est region, France

Ionel Haidu, Mărgărit-Mircea Nistor

First Published: 22 March 2019

Long-term stability of meteorological temperature sensors

Aleksandra Kowal, Andrea Merlone, Tymoteusz Sawiński

First Published: 22 March 2019

Mapping spatial variability of annual rainfall under different return periods in Turkey: Application of various distribution functions and model selection techniques

Fatih Tosunoglu, Faruk Gurbuz

First Published: 18 March 2019

Quarterly Journal of the Royal Meteorological Society

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Pages: i-iv, 395-892

January 2019 Part B

ISSUE INFORMATION

Issue Information

Pages: i-iv | First Published: 08 March 2019

RESEARCH ARTICLES

A 4D feature-tracking algorithm: A multidimensional view of cyclone systems

Susan Gabriela Lakkis, Pablo Canziani, Adrián Yuchechen, Leandro Rocamora, Agustin Caferri, Kevin Hodges, Alan O'Neill

Pages: 395-417 | First Published: 22 November 2018

An objective four-dimensional (4D) algorithm developed to track extratropical relative vorticity anomaly 3D structure over time is introduced and validated. The mean distribution of Southern Hemisphere cyclone systems detected by STACKER during the 2015 winter is shown in the upper image. STACKER provides the detected anomaly tracks corresponding to a given relative vorticity (RV) anomaly event as well as the anomaly itself. The lower image shows a cyclone event highlighting the tracks at levels where the event was detected as well as the RV anomalies, which show the anomaly's 3D structure.

Estimation of physical parameters under location uncertainty using an ensemble2–expectation–maximization algorithm

Yin Yang, Etienne Mémin

Pages: 418-433 | First Published: 24 November 2018

Estimated parameter spatial profiles with respect to iterations of the proposed ensemble2–expectation–maximization algorithm. The algorithm that we propose in this paper is a novel ensemble formulation of the maximization step in the expectation–maximization (EM) algorithm that allows for a direct optimal estimation of physical parameters using iterative methods for a

linear system. This algorithm is able to successfully identify the unknown physical parameter field associated with a stochastic shallow-water system from observations on height and velocity with considerably higher accuracy than the augmented state techniques.

Effects of the wind–mass balance constraint on ensemble forecasts in the hybrid-4DEnVar

Hyo-Jong Song, Jeon-Ho Kang

Pages: 434-449 | First Published: 24 November 2018

In the Antarctic lower stratosphere, temperature analysis skill is improved by the wind–mass constraint used continuously. In the tropical mid–/lower troposphere, the same constraint also increases the humidity analysis performance. The balance enhanced by the additional constraint on the ensemble background error covariance helps the model better adopt the analysis.

Sensible heating as a potential mechanism for enhanced cloud formation over temperate forest

Peter J. M. Bosman, Chiel C. van Heerwaarden, Adriaan J. Teuling

Pages: 450-468 | First Published: 24 November 2018

Cloud cover strongly depends on the distribution of the incoming solar and thermal energy between heating and evaporation, and therefore land use is crucial in determining cloud cover. We performed large-eddy simulation experiments with various combinations of heating and evaporation. We found for our case study of a temperate forest that increases in the sensible heat flux are more important for cloud cover than increases in the latent heat flux, and have illustrated the mechanisms responsible for this.

An atmospheric Bénard problem

Maurizio Fantini

Pages: 469-475 | First Published: 25 November 2018

Non-dimensional pressure Π_1 at $\delta z = 1$ as a function of non-dimensional parameters Δ and γ . For $\Delta < -1$ potential temperature also becomes negative.

Noise-induced vortex-splitting stratospheric sudden warmings

J. Gavin Esler, Márton Mester

Pages: 476-494 | First Published: 04 December 2018

A simple model of vortex-splitting stratospheric sudden warmings, in which vortex splits occur due to the presence of weak noise in the forcing, is introduced. It is shown that, in certain limits, the model can be reduced to a random walk in a single variable. The figure shows vortex splits in six model integrations. The splits occur at random times, with each being triggered by the random walk hitting a threshold value. The expected time for this to happen, as a function of the model parameters, is calculated. The relevance of the simple model to observed polar vortex evolution in the Antarctic winter is investigated. Results point towards a “noise-memory” paradigm, in which the history of the forcing contributes to either a winter season with a quiescent vortex or large-amplitude oscillations or, in extreme cases, a vortex split.

[A method to determine the characteristic time-scales of quasi-isotropic surface-layer turbulence over complex terrain: A case-study in the Adige Valley \(Italian Alps\)](#)

Marco Falocchi, Lorenzo Giovannini, Massimiliano de Franceschi, Dino Zardi

Pages: 495-512 | First Published: 03 December 2018

Especially over complex terrain, disentangling terrain effects from more intrinsic turbulence properties requires a proper identification and separation of the low-frequency components from the smaller-scale properties. This article proposes a method to estimate the time-scales of surface-layer turbulence from the analysis of the spectral distribution of the degree of isotropy. The procedure is applied on a dataset collected in complex terrain and tested by evaluating the agreement of second-order statistical moments of turbulent variables on similarity functions.

[Estimation of ground-based GNSS Zenith Total Delay temporal observation error correlations using data from the NOAA and E-GVAP networks](#)

Stephen Macpherson, Stéphane Laroche

Pages: 513-529 | First Published: 28 November 2018

In this study, two popular diagnostic methods, the Desroziers method and the Hollingsworth–Lönnberg method, are applied to estimate temporal error correlations associated with ground-based GNSS Zenith Total Delay (ZTD) observations from the NOAA and E-GVAP networks. The dependency of the Desroziers method results on the prescribed background error covariances in the data assimilation system is examined. While considerable uncertainty is associated with the results from both methods, the results do suggest that the ZTD observation error decorrelation time-scale is in the 2–6 h range and so the temporal error correlations should be considered in NWP applications where time series ZTD data are assimilated.

[On the dynamical coupling between atmospheric blocks and heavy precipitation events: A discussion of the southern Alpine flood in October 2000](#)

Sina Lenggenhager, Mischa Croci-Maspoli, Stefan Brönnimann, Olivia Martius

Pages: 530-545 | First Published: 06 December 2018

In this study, we describe the synoptic development during the month prior to one of the major flood events in southern Switzerland and investigate the role of atmospheric blocking in the formation of the heavy precipitation events as well as the role of heavy precipitation in the maintenance of atmospheric blocking.

Microfronts in the nocturnal boundary layer

Larry Mahrt

Pages: 546-562 | First Published: 07 December 2018

Microfronts with sharp temperature changes near the surface of the nocturnal boundary layer are common. Unexpectedly, the microfronts are typically associated with momentum disturbances over a deeper layer. The microfronts are generally embedded within a thermally indirect circulation with rising cold air and sinking warm air.

Hydrostatic vertical velocity and incompressibility in the Northern Hemisphere

Joseph Egger, Klaus-Peter Hoinka

Pages: 563-574 | First Published: 07 December 2018

Observed time-mean vertical velocity \overline{w} in 10–3 m/s as obtained from ERA-Interim data at 5 km (a), 10 km (b), 15 km (c) and continent outlines (d). Negative values are shaded.

The asymmetric eddy–background flow interaction in the North Pacific storm track

Yuan-Bing Zhao, X. San Liang, Zhaoyong Guan, Kevin I. Hodges

Pages: 575-596 | First Published: 21 December 2018

The nonlinear eddy–background flow interaction in the North Pacific storm track is investigated in an eddy-following way. It is found that overall the storm lies in the northern part of the jet; this relative location determines a unique asymmetric interaction pattern, with a downscale baroclinic energy transfer (baroclinic instability) in the north part of the storm and an upscale barotropic energy transfer in the south. As a result, the jet strengthens but becomes narrower.

Simulation and diagnosis of observation, model and background error contributions in data assimilation cycling

Loïc Berre

Pages: 597-608 | First Published: 10 December 2018

Temporal diagram of cycle dates associated with different contributions to errors of the forecast that is issued from the analysis computed at time t_i : errors result from old background errors corresponding to the old step t_0 , recent observation errors and recent model errors, which are both introduced at recent cycling steps t_j , with $t_0 \leq t_j \leq t_i$. Each vertical tick corresponds to a specific analysis time. For a given analysis time t_j , observation errors are introduced during the analysis step, while model errors accumulate during the subsequent forecast step, until the next analysis step at t_{j+1} .

An efficient semi-implicit temporal scheme for boundary-layer vertical diffusion

Arman Rokhzadi, Abdolmajid Mohammadian

Pages: 609-619 | First Published: 12 December 2018

The nonlinear vertical diffusion turbulent boundary-layer flows can be solved more efficiently by the weight-averaged semi-implicit Runge–Kutta scheme. The accuracy is improved and the calculation cost is competitive to the current semi-implicit schemes.

Assimilating cloudy and rainy microwave observations from SAPHIR on board Megha Tropiques within the ARPEGE global model

Fabrice Duruisseau, Philippe Chambon, Eric Wattrelot, Marylis Barreyat, Jean-François Mahfouf

Pages: 620-641 | First Published: 11 December 2018

Microwave observations from space-borne sounders provide precious data for initializing numerical weather prediction models, in particular in cloudy and rainy conditions. Indeed, numerical models often mis-locate clouds and precipitation as shown in the figure for a convective case along the Thailand coastline for which the observed clouds (left figure) are located eastward of the modelled ones (right figure). The article presents a methodology for taking benefit of microwave observations to better predict clouds and precipitation through better initial conditions.

Stochastically perturbed bred vectors in multi-scale systems

Brent Giggins, Georg A. Gottwald

Pages: 642-658 | First Published: 13 December 2018

Ensemble forecasting is widely used to issue probabilistic forecasts. A non-trivial challenge is to find good initial conditions from which to start such a forecast. An attractive method employs so-called bred vectors. They are dynamically adapted and computationally cheap, but lack sufficient spread. We introduce here stochastically perturbed bred vectors which share the same advantages and in addition mitigate the problem of insufficient diversity, producing a reliable ensemble with good forecasting skills.

Ensemble reduction using cluster analysis

Stefano Serafin, Lukas Strauss, Manfred Dorninger

Pages: 659-674 | First Published: 20 December 2018

The figure uses colour to display the result of a cluster analysis. Individual objects are the members of an ensemble forecast system and three clusters are detected. Ensemble reduction consists of choosing one representative member from each cluster. Ensemble reduction by clustering gives useful results only at forecast ranges longer than 3 days.

Probabilistic forecasts of tropical cyclone tracks and intensities in the southwest Indian Ocean basin

Francois Bonnardot, Hubert Quetelard, Guillaume Jumaux, Marie-Dominique Leroux, Miloud Bessafi

Pages: 675-686 | First Published: 18 December 2018

This article presents a new probabilistic method for tropical cyclone (TC) forecasts, being actually the first one for TC intensity prediction in the southwest Indian Ocean basin. It describes the different steps to generate alternate scenarios from a deterministic official forecast for track and intensity. Each scenario is assigned a specific probability combining statistical and dynamical information. The limited (about 20) number of scenarios allows us to perform further impact-oriented applications.

West Antarctic surface melt event of January 2016 facilitated by föhn warming

Xun Zou, David H. Bromwich, Julien P. Nicolas, Alvaro Montenegro, Sheng-Hung Wang

Pages: 687-704 | First Published: 21 December 2018

The presence of föhn warming during the prominent 2016 melt event over the Ross Ice Shelf is investigated primarily for 10 and 11 January. Through trajectory analysis, detailed quantification of the various physical mechanisms contributing to the föhn warming is provided, particularly in the Siple Dome area. This study provides a better understanding of the climate of the Ross Ice Shelf, which is important to predict its future response to climate change.

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January 2019 Part A

ISSUE INFORMATION

Issue Information

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RESEARCH ARTICLES

Towards more realistic hypotheses for the information content analysis of cloudy/precipitating situations – Application to a hyperspectral instrument in the microwave

Filipe Aires, Catherine Prigent, Stefan A. Buehler, Patrick Eriksson, Mathias Milz, Susanne Crewell

Pages: 1-14 | First Published: 15 July 2018

From top to bottom, retrieval improvements for T, Q, CLW, CIW, RWC and SWC; and from left to right, for bands at 60, 118, 183, 325, 420+448 GHz and TOTAL. Statistics are represented for the four selected situations and, in black, for the average on the 25 atmospheric situations.

Comparison of different representations of model error in ensemble forecasts

Chiara Piccolo, Mike J. P. Cullen, Warren J. Tennant, Adrian T. Semple

Pages: 15-27 | First Published: 29 June 2018

Geographical distribution of T+6 h ensemble spread, using different model error representations and the same initial conditions, for zonal wind component ($m s^{-1}$) at 500 hPa. (a) represents the CNT run, (b) the difference between SPT and CNT, and (c) the difference between AI and CNT

Analysis of observed rapid increases in surface wind speed

Florian Ruff, Haraldur Ólafsson

Pages: 28-39 | First Published: 10 July 2018

A database of 21 million hourly observations from 200 weather stations in Iceland within the period from January 1993 until March 2017 is explored to assess rapid increases of wind speed. In the summer, strong winds are more frequent in the afternoon than at night, while rapid increases in wind speed are slightly more frequent at night. Westerly winds have a relatively high frequency of rapid increases in wind speed, while easterly winds have a relatively low frequency of rapid increases in wind speed. This can be explained by the form and tracks of cyclones. Rapid increases in wind speed are particularly frequent in northern Iceland. They occur in winds blowing from the central highlands and typically in stably stratified air masses. An analysis of winds at individual stations reveals a large impact of topography and that the wind direction distribution for strong wind events and rapid increases in wind speed may be quite different. However, a simple, clear and general connection between the height and distance to nearby mountains and the frequency of rapid increases in wind speed has not been found. At stations with a high frequency of rapid increases in wind speed, downslope flow is a very important contributor, while gap and corner winds are not.

Quantifying the predictability of a predictand: Demonstrating the diverse roles of serial dependence in the estimation of forecast skill

Alexander S. Jarman, Leonard A. Smith

Pages: 40-52 | First Published: 24 July 2018

Serial dependence in forecast skill results in misleading estimates of the quality of a forecast system when evaluated in a time-series fashion. A wide variety of impacts are possible in addition to systematic biases established elsewhere which demonstrate that sample size corrections are required to correctly interpret the statistical significance of the estimated skill. Extensions to forecast systems which display (a) no linear correlation in the predictand yet serial dependence in the prediction skill, (b) linear correlation in the predictand yet no serial dependence in skill, and (c) linear correlation in both the predictand and skill are discussed; empirical approaches to estimated sample size corrections (when analytic results are not available) are introduced.

Adaptive covariance inflation in the ensemble Kalman filter by Gaussian scale mixtures

Patrick N. Raanes, Marc Bocquet, Alberto Carrassi

Pages: 53-75 | First Published: 31 July 2018

This paper studies multiplicative inflation: the complementary scaling of the state covariance in the ensemble Kalman filter (EnKF). Firstly, error sources in the EnKF are catalogued and discussed in relation to inflation; nonlinearity is given particular attention as a source of sampling error. In response, the “finite-size” refinement known as the EnKF-N is re-derived via a Gaussian scale mixture, again demonstrating how it yields adaptive inflation. An extension is proposed that hybridizes the EnKF-N with an existing adaptive inflation scheme, making it suitable also in the presence of model error.

Lagrangian transport across the upper Arctic waters in the Canada Basin

Francisco Balibrea-Iniesta, Jiping Xie, Víctor J. García-Garrido, Laurent Bertino, Ana M. Mancho, Stephen Wiggins

Pages: 76-91 | First Published: 24 September 2018

This work studies transport on a daily basis across selected circulation patterns in the upper Arctic Ocean waters from a Lagrangian perspective. With the support of a dynamical system tool called the function M, we identify in the Beaufort Gyre a hyperbolic trajectory in a detachment configuration along the North American coast. The hyperbolic point is a moving saddle with a stable manifold aligned with the coast and an unstable manifold transversal to it, which acts as a barrier preventing the saltier Chukchi Sea waters from mixing with the fresher Beaufort Gyre. Stable and unstable manifolds form intersecting structures such as those visible in this image. Our Lagrangian tools also reveal the Transpolar Drift Stream as a jet-like dynamical barrier and illustrate its variability throughout the analysed period.

Seasonal forecast skill for extratropical cyclones and windstorms

Daniel J. Befort, Simon Wild, Jeff R. Knight, Julia F. Lockwood, Hazel E. Thornton, Leon Hermanson, Philip E. Bett, Antje Weisheimer, Gregor C. Leckebusch

Pages: 92-104 | First Published: 19 September 2018

In this study, the skill of three state-of-the-art seasonal prediction systems is analysed for Northern Hemisphere extratropical windstorm and cyclone events. Results show significant skill for the eastern Atlantic/central Europe in the latest two systems (see Figure showing rank coefficients of annual track densities for windstorms). Furthermore, using the North Atlantic Oscillation (NAO) as predictor for windstorm activity adds some value over northern Europe but for large areas over Europe using the full model information is superior.

The western Pacific subtropical high and tropical cyclone landfall: Seasonal forecasts using the Met Office GloSea5 system

Joanne Camp, Malcolm J. Roberts, Ruth E. Comer, Peili Wu, Craig MacLachlan, Philip E. Bett, Nicola Golding, Ralf Toumi, Johnny C. L. Chan

Pages: 105-116 | First Published: 28 September 2018

The western Pacific subtropical high (WPSH) strongly modulates tropical cyclone (TC) tracks, including landfall frequency in East Asia. In this paper we show that the Met Office seasonal forecasting system GloSea5 exhibits significant skill for predictions of the WPSH index from June to August. These results suggest potential for operational seasonal forecasts of TC landfall risk for East Asia using the predicted WPSH. Such forecasts could be of significant benefit to emergency management.

Impact of radar data assimilation and orography on predictability of deep convection

Kevin Bachmann, Christian Keil, Martin Weissmann

Pages: 117-130 | First Published: 12 October 2018

Deep convection represents a classic example of limited predictability on the convective scale. We investigate the potential impact of assimilating radar reflectivity and velocity observations on the predictive skill of precipitation in short-term forecasts using the operational COSMO-KENDA ensemble data assimilation and forecasting system in an idealized set-up. Additionally, the role of a Gaussian-shaped mountain providing a permanent source of predictability for the location of convective precipitation is examined with and without data assimilation.

The importance of stratospheric initial conditions for winter North Atlantic Oscillation predictability and implications for the signal-to-noise paradox

Christopher H. O'Reilly, Antje Weisheimer, Tim Woollings, Lesley J. Gray, Dave MacLeod

Pages: 131-146 | First Published: 12 October 2018

(a) shows the ratio-of-predictable-components (RPC) for the NAO in the ERA-40/Int IC, ERA-20C IC, Correct SST-only and Correct IC-only hindcast experiments. Also shown in unfilled blue bars are RPC values for the post-processed ERA-40/Int IC hindcast experiment, where the QBO influence on the NAO in each ensemble member has been amplified (or reduced) by various factors. (b) shows the ensemble mean NAO correlation in the same ensemble hindcast experiments.

Signal and noise in regime systems: A hypothesis on the predictability of the North Atlantic Oscillation

Kristian Strommen, Tim N. Palmer

Pages: 147-163 | First Published: 10 October 2018

The North Atlantic Oscillation is a key driver of European winter weather (pictured here). While skill in predicting it has improved notably in recent decades, models still appear to have too small a signal-to-noise ratio, implying that the real world is more predictable than models think. We present and analyse a regime-based toy model, which shows that both the high skill and deficient signal could be a result of models capturing regime dynamics but systematically underestimating regime persistence.

Sensitivity of the surface orographic gravity wave drag to vertical wind shear over Antarctica

Holly V. Turner, Miguel A. C. Teixeira, John Methven, Simon B. Vosper

Pages: 164-178 | First Published: 18 October 2018

Inverse of the Richardson number Ri^{-1} averaged seasonally using daily data over the decade 2006–2015 at the boundary-layer height for (a) DJF, (b) JJA.

Multiscale characteristics of an extreme precipitation event over Nepal

Patrik Bohlinger, Asgeir Sorteberg, Changhai Liu, Roy Rasmussen, Harald Sodemann, Fumiaki Ogawa

Pages: 179-196 | First Published: 21 October 2018

This study describes processes that facilitate an extreme precipitation event in Nepal. We explain how these processes enable the unusual and intense convective development of a not unusual (for the considered region) convective system. The figure shows the simulated daily precipitation against the records of rain-gauge stations in Nepal.

The energy cascade associated with daily variability of the North Atlantic Oscillation

José M. Castanheira, Carlos A. F. Marques

Pages: 197-210 | First Published: 30 October 2018

An analysis of anomalies of the energy cascade associated with the NAO was performed. The main result suggests that the NAO is due to baroclinic eddy activity rather than a modulating factor of the eddy activity.

Azimuthally averaged structure of Hurricane Edouard (2014) just after peak intensity

Roger K. Smith, Michael T. Montgomery, Scott A. Braun

Pages: 211-216 | First Published: 09 November 2018

Radius–height cross sections of selected fields derived from the dropsonde data: (a) tangential velocity component, contour interval 5 m/s, shading indicated on the side bar in m/s, and absolute angular momentum, black lines, contour interval $5 \times 10^5 \text{ m}^2/\text{s}$; (b) temperature perturbation, contour interval 2 K (positive values), 1 K (negative values), shading indicated on the side bar in K; (c) radial velocity component, contour interval 3 m/s, shading indicated on the side bar in m/s; (d) equivalent potential temperature, contour interval 10 K, shading indicated on the side bar in K, and absolute angular momentum, black lines, contours as in (a); (e) relative

humidity, contour interval 10%, shading indicated on the side bar in %; and (f) a zoomed-in version of (d) at heights below 3 km.

Data assimilation strategies for state-dependent observation error variances

Craig H. Bishop

Pages: 217-227 | First Published: 09 November 2018

When the observation error variance R is a function of the unknown true state, R is unknown. It is shown that the R of unbiased observations of bounded variables must tend to zero as the true value approaches the bound. Three distinct strategies for choosing the R needed by EnKF and variational data assimilation schemes are considered. It is shown that letting R be the mean of the prior distribution of R values is the best of these choices.

Impact of two-way coupling and sea-surface temperature on precipitation forecasts in regional atmosphere and ocean models

Benedikt Strajnar, Jure Cedilnik, Anja Fettich, Matjaž Ličer, Neva Pristov, Peter Smerkol, Jurij Jerman

Pages: 228-242 | First Published: 11 November 2018

Five heavy-precipitation events over the Adriatic Sea are modelled using two-way coupled regional ocean and numerical weather prediction models. Six modelling set-ups with various application of SST information, air–sea coupling and data assimilation are evaluated. Two-way coupling is superior to one-way coupling, but SST update frequency also plays a major role.

On the stochastic parametrization of short-scale processes

Catherine Nicolis, Gregoire Nicolis

Pages: 243-257 | First Published: 13 November 2018

The modelling of the deterministic dynamics of short-scale atmospheric processes by Gaussian Markov noises is addressed. Conditions are derived under which asymptotic properties such as the invariant probability density of the original deterministic system tend to those induced by the action of appropriately parametrized Gaussian white noise. In contrast, it is shown that time-dependent properties in connection with predictability as captured by the short-time behaviour of the variance and recurrence time statistics are poorly represented by the stochastic parametrization procedure.

Ensemble singular vectors as additive inflation in the Local Ensemble Transform Kalman Filter (LETKF) framework with a global NWP model

Seoleun Shin, Ji-Sun Kang, Shu-Chih Yang, Eugenia Kalnay

Pages: 258-272 | First Published: 13 November 2018

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Welcome to AMS News You Can Use.

Each week, we send out a sampling of recent news and items of interest in meteorology and related fields, as covered by various media outlets.

March 26, 2019

News

The 5 Worst Winter U.S. Locations of 2018-19

March 26, 2019 - The Weather Channel

Winter 2018-19 is officially over, and for five locations in the United States, it isn't a moment too soon.

[Read MORE](#)

A Cruise Ship Sailed into an Intense Cyclone. These Warning Signs Showed Trouble Was Brewing at Sea.

March 26, 2019 - The Washington Post

The storm system that would eventually terrify people aboard the Viking Sky didn't come without warning. Instead, the sprawling low-pressure zone was hinted at by weather models up to a week in advance.

[Read MORE](#)

Amid 19-Year Drought, States Sign Deal to Conserve Colorado River Water

March 26, 2019 - The New York Times

Seven Western states have agreed on a plan to manage the Colorado River amid a 19-year drought, voluntarily cutting their water use to prevent the federal government from imposing a mandatory squeeze on the supply.

[Read MORE](#)

Florence, Michael Retired Following Destructive U.S. Strikes During 2018 Atlantic Hurricane Season

March 26, 2019 - The Weather Channel

Florence and Michael were so destructive and deadly during the 2018 Atlantic hurricane season that the World Meteorological Organization's hurricane committee decided this week to retire those names from future Atlantic Basin tropical cyclone name lists.

[Read MORE](#)

Drone Trains Its Eyes on Flood Waters to Improve Forecasts

March 26, 2019 - NOAA

As the Yalobusha River rose around Greenwood, Mississippi, scientists deployed a small unmanned plane that took high-resolution images of rising waters and beamed them back in real time to NOAA weather forecasters.

[Read MORE](#)

California's Super Bloom Is the Best in Years, so Vibrant It Can Be Seen from Space

March 26, 2019 - The Washington Post

Abundant rain and mountain snow have spurred a "super bloom apocalypse." The photos are magnificent.

[Read MORE](#)

Auburn University Professor, Team Discover Breakthrough Process that Will Boost Ability to Predict Drought

March 26, 2019 - Alabama Newscenter

A team of researchers recently discovered soil moisture re-emergence, a phenomenon that experts say will have a profound impact on climate predictability science, particularly in the long-term forecasting of drought.

[Read MORE](#)

Louisiana's Disappearing Coast

March 25, 2019 - The New Yorker

Attempts to harness the Mississippi River have led to a land-loss crisis in Louisiana. A huge public-works project, aimed at correcting for the unintended consequences of previous interventions, is getting under way.

[Read MORE](#)

[NASA satellite captures a spectacular 'fireball' exploding above the Bering Sea](#)

March 25, 2019 - AccuWeather.com

NASA released the images of the fireball, the astronomical term used for exceptionally bright meteors that are spectacular enough to be visible over a wide area, on Friday, March 22.

[Read MORE](#)

[The Midwest flooding has killed livestock, ruined harvests and has farmers worried for their future](#)

March 24, 2019 - MyFOX8.com

Farmers in parts of Nebraska and Iowa had precious little time to move themselves from the floodwaters that rushed over their lands last week, so many left their livestock and last year's harvest behind.

[Read MORE](#)

[This weekend's solar storm is nothing next to what's hit Earth before](#)

March 24, 2019 - MSN.com

The tail end of a solar storm that erupted from the sun earlier this week is expected to smash into Earth's magnetic field this weekend, making the aurora borealis (also known as the northern lights) visible as far south as Chicago.

[Read MORE](#)

[Study: Multiple factors contribute to worsening California wildfire seasons](#)

March 22, 2019 - ABC 10

Increasing temperature due to climate change, heavy fuels in forests, and fire suppression policies are key reasons for the recent worsening of fire conditions over the past century, the study found.

[Read MORE](#)

What Makes People Heed A Weather Warning — Or Not?

March 22, 2019 - Southern California Public Radio

"We have not had anything of this nature before." It's something commonly heard in the aftermath of deadly disasters. It's what Alabama Sheriff Jay Jones said after a tornado killed 23 people in Lee County earlier this month.

[Read MORE](#)

Photos: what Mozambique's unfolding flooding catastrophe looks like

March 22, 2019 - Vox

Flooding following Cyclone Idai has left hundreds dead and more than 100,000 displaced in Mozambique, Zimbabwe, and Malawi.

[Read MORE](#)

'Unprecedented' U.S. Flood Season Will Imperil Millions, Experts Warn

March 22, 2019 - CityLab

Two-thirds of the lower 48 states will have a heightened risk until May, NOAA forecast says, after severe flooding in the Midwest.

[Read MORE](#)

Tropical cyclone Idai: The storm that knew no boundaries

March 21, 2019 - Public Radio International

Tropical cyclone Idai has made headlines across southern Africa throughout the month of March. Lingering in the Mozambique Channel at tropical cyclone intensity for six days, the storm made landfall in Beira, Mozambique in the middle of the month, then tracked in a westerly direction until its dissipation.

[Read MORE](#)

Mitigating the loss of satellite data by using CubeSat remote sensing technology

March 20, 2019 - Phys.org

Advanced infrared and microwave sounding systems, usually onboard traditional polar-orbiting satellites, provide atmospheric sounding information critical for nowcasting and weather forecasting through data assimilation in numerical weather prediction models.

[Read MORE](#)

[Untangling the Physics Behind Drifting Embers, 'Firenadoes' and Other Wildfire Phenomena](#)

March 19, 2019 - Smithsonian.com

Fires can leap rapidly from building to building and even cause extreme weather events such as pyrocumulonimbus storm clouds

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[The ratio of warm and cold temperature records is increasingly skewed](#)

March 19, 2019 - Axios

As the average global temperature increases due to human-caused global warming, the ratio between warm temperature and cold temperature records in the U.S. is increasingly skewed toward heat milestones, an Associated Press analysis shows.

[Read MORE](#)

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NATURE Climate Change magazine

April 2019, Vol 9 Issue 4

Editorial

[Gender in conservation and climate policy p255](#)

doi:10.1038/s41558-019-0448-2

Correspondence

[The race to remove CO2 needs more contestants p256](#)

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doi:10.1038/s41558-019-0445-5

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Growth in destruction p257

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Greenland feels the heat p257

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Drivers of transnational action p257

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doi:10.1038/s41558-019-0452-6

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Diversity in decision-making pp258 - 259

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doi:10.1038/s41558-019-0441-9

From trails to models pp259 - 260

Henry P. Huntington

doi:10.1038/s41558-019-0439-3

Perspectives

A pathway design framework for national low greenhouse gas emission development strategies

pp261 - 268

Henri Waisman, Chris Bataille, Harald Winkler, Frank Jotzo, Priyadarshi Shukla et al.

doi:10.1038/s41558-019-0442-8

The Deep Decarbonization Pathways Project develops a framework to design low-emission development pathways. This Perspective discusses the framework and how it can support the development of national strategies to meet climate targets, as well as help achieve stakeholder engagement.

Progressing emergent constraints on future climate change pp269 - 278

Alex Hall, Peter Cox, Chris Huntingford & Stephen Klein

doi:10.1038/s41558-019-0436-6

Emergent constraints can be an evaluation tool for Earth System Models. This Perspective discusses emergent constraints, how they should be assessed, and when these statistical relationships can be confirmed and used to improve understanding of the changing climate system.

Review Articles

[Learning about urban climate solutions from case studies pp279 - 287](#)

William F. Lamb, Felix Creutzig, Max W. Callaghan & Jan C. Minx

doi:10.1038/s41558-019-0440-x

Cities around the world are at the forefront of enacting climate mitigation policies, but effective action requires a better understanding of potential solutions. This Review offers a systematic exploration of the urban case study literature and discusses ways to best make use of the growing body of cases.

Matters Arising

[Faster fuelling is the key to faster migration pp288 - 289](#)

Åke Lindström, Thomas Alerstam & Anders Hedenström

doi:10.1038/s41558-019-0443-7

Letters

[Robust abatement pathways to tolerable climate futures require immediate global action pp290 - 294](#)

J. R. Lamontagne, P. M. Reed, G. Marangoni, K. Keller & G. G. Garner

doi:10.1038/s41558-019-0426-8

Uncertainties are often cited as a reason for mitigation inaction. Here, millions of scenarios are evaluated to assess the relative importance of human–earth system uncertainties and policy variables. The growth rate of global abatement is found to be the primary driver of long-term warming.

[Halving warming with idealized solar geoengineering moderates key climate hazards pp295 - 299](#)

Peter Irvine, Kerry Emanuel, Jie He, Larry W. Horowitz, Gabriel Vecchi et al.

doi:10.1038/s41558-019-0398-8

High-resolution coupled climate model simulations suggest only 0.4% of the land surface will see exacerbated hydrological risks under solar geoengineering that halves warming, indicating that geoengineering-related risks may be overstated.

Enhanced land–sea warming contrast elevates aerosol pollution in a warmer world pp300 - 305

Robert J. Allen, Taufiq Hassan, Cynthia A. Randles & Hui Su

doi:10.1038/s41558-019-0401-4

Greater land–sea temperature contrast under anthropogenic warming will enhance aerosol concentrations, reveal model simulations, linked to reductions in large-scale cloud cover and corresponding decreases in precipitation and aerosol wet removal.

Marine heatwaves threaten global biodiversity and the provision of ecosystem services pp306 - 312

Dan A. Smale, Thomas Wernberg, Eric C. J. Oliver, Mads Thomsen, Ben P. Harvey et al.

doi:10.1038/s41558-019-0412-1

Marine heatwaves are increasing in frequency, but they vary in their manifestation. All events impact ecosystem structure and functioning, with increased risk of negative impacts linked to greater biodiversity, number of species near their thermal limit and additional human impacts.

Sudden emergence of a shallow aragonite saturation horizon in the Southern Ocean pp313 - 317

Gabriela Negrete-García, Nicole S. Lovenduski, Claudine Hauri, Kristen M. Krumhardt & Siv K. Lauvset

doi:10.1038/s41558-019-0418-8

The aragonite saturation horizon depth is an indicator of ocean acidification. Model projections show that a new shallow horizon emerges in the Southern Ocean before 2100, reducing suitable habitat for calcifying species in the near future.

Rapid growth in greenhouse gas emissions from the adoption of industrial-scale aquaculture pp318 - 322

Junji Yuan, Jian Xiang, Deyan Liu, Hojeong Kang, Tiehu He et al.

doi:10.1038/s41558-019-0425-9

China dominates the global growth in aquaculture food production, primarily through massive conversion of paddy fields to crab ponds. This land conversion is greatly increasing methane emissions but these can be significantly reduced by water aeration.

Global habitat loss and extinction risk of terrestrial vertebrates under future land-use-change scenarios pp323 - 329

Ryan P. Powers & Walter Jetz

doi:10.1038/s41558-019-0406-z

This paper uses a range of shared socioeconomic pathways scenarios to estimate the future terrestrial vertebrate habitat loss and extinction risk that could result from projected global land-use change.

Articles

[Gender quotas increase the equality and effectiveness of climate policy interventions pp330 - 334](#)

Nathan J. Cook, Tara Grillos & Krister P. Andersson
doi:10.1038/s41558-019-0438-4

Decision-making structures in forest-user communities often exclude women. This lab-in-field experiment shows that groups in which at least 50% of members were women conserved more trees, and distributed benefits more equally, in a payment for ecosystem services intervention.

[Changing access to ice, land and water in Arctic communities pp335 - 339](#)

J. D. Ford, D. Clark, T. Pearce, L. Berrang-Ford, L. Copland et al.
doi:10.1038/s41558-019-0435-7

Climate change has the potential to profoundly affect Arctic transportation systems. Here, Indigenous knowledge and climate data are integrated to model changing trail access for Canada's Inuit communities over the past 30 years

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