research highlights

WILDFIRE

Risk drivers

Ambio http://doi.org/ctsn (2018)

Credit: Eddie Gerald/Alamy Stock Photo

Last year (2017) was an exceptionally high wildfire year globally, and 2018 is shaping up to be similarly severe. If the risks associated with wildfire are to be managed, the main factors that control fire dynamics must be clearly understood.

To this end, David Bowman from The University of Tasmania, Australia, and co-workers investigated the drivers of the 2017 fires in Mediterranean Chile, which were particularly severe and may offer insights into fire dynamics in other Mediterranean regions. Using satellite (MODIS) data combined with climate and land-use records, they identify a number of factors that led to the exceptionally energetic fires of January 2017.

Extreme fire weather (a combination of high temperature, low relative humidity, wind and low 24-hour rainfall) was certainly a contributing factor. Land-cover change involving the conversion of native vegetation (now accounting for <20% of land area) and the expansion of flammable exotic species (which occupied 44% of the burned area) was also important. Climate and land-use trends are therefore converging to significantly increase risks of wildfire and smoke pollution in parts of Chile and similar Mediterranean regions. *AB*

https://doi.org/10.1038/s41558-018-0300-0

AIR POLLUTION

Solar power reduced by haze

Energy Environ. Sci. http://doi.org/ctsp (2018)

Solar photovoltaics (PVs) are an integral part of global climate mitigation strategies. Solar power offers air quality benefits, but its efficacy may be impacted by pollution in the lower atmosphere that reduces the amount of light reaching the solar installation.

To determine the extent of this effect, Ian Marius Peters of the Massachusetts Institute of Technology, USA, and colleagues derive an equation for the relationship between $PM_{2.5}$ concentrations and insolation using high-resolution data from Delhi, India. The empirical relationship is then extended to assess potential insolation reductions for 16 other cities. Losses in radiant exposure range from 1.9% (Bogota, Colombia) to 12.2% (Delhi, India). Possible revenue losses from reduced exposure range from US$5.9 million (Los Angeles, USA) to US$20 million (Delhi), given current installation targets and electricity prices.

The functional relationship between air pollution and insolation received by silicon PV panels presented here is a first indicator, and therefore subject to uncertainties. More research is needed to assess the impact of urban air pollution on PV power potential. *AY*

https://doi.org/10.1038/s41558-018-0301-z

OCEANOGRAPHY

Pacific oxygen changes

Glob. Biogeochem. Cycles http://doi.org/gd3t78 (2018)

Dissolved oxygen (O_2) is essential for marine ecosystems, but as the ocean warms levels are expected to decrease because the solubility of gases is reduced. Stratification also increases, reducing mixing and gas exchange from the surface to depth.

Using six CMIP5 Earth system models and an ocean general circulation model (MITgcm), Yohei Takano of the Georgia Institute of Technology, Atlanta, USA (now at the Max Planck Institute for Meteorology, Hamburg, Germany), and colleagues investigate the mechanisms controlling oxygen changes out to 2100 for the Pacific Ocean. Under a high-emissions scenario (RCP8.5), they show that warming is the main cause of deoxygenation in subsurface waters. At mid-to-high latitudes, decreased solubility and reduced ventilation of the subsurface are primarily responsible, with small contributions from wind and precipitation–evaporation changes. For the tropical Pacific, which already has low oxygen levels, smaller changes are projected as warming reduces the demand for oxygen due to organic matter decomposition (in addition to solubility) and circulation changes result in younger waters in this location. This highlights the need to understand regional circulation characteristics when considering future oxygen losses. *BW*

https://doi.org/10.1038/s41558-018-0302-y

MARINE BIOLOGY

Loss of sea-ice algae

J. Geophys. Res. Oceans http://doi.org/ctsj (2018)

Credit: Buiten-Beeld/Alamy Stock Photo

Sea-ice algae are the cornerstone of ecological activity in the Arctic, fuelling upper trophic levels during spring blooms. However, ice algae production is threatened by anthropogenic warming, specifically through changes in sea-ice thickness, the timing of advance and retreat, and associated shifts in overlying snow. Virginia Selz and colleagues from Stanford University, USA, examine the drivers of ice algae variability in the Chukchi Sea over the period 1980–2015 using a using a one-dimensional coupled physical–biological ice ecosystem model alongside observations.

Annual ice algal net primary production is found to have decreased by 22% since 1980. This reduction can be attributed to the earlier melt and retreat of sea ice, which decreases the length of the algal growing season. However, thinner overlying snowpacks — and therefore greater light availability — could potentially offset melt-driven algal declines by promoting earlier bloom onset. Thus, while projected changes in Arctic sea ice imply continued reductions in ice algal productivity in the Chukchi Sea, thinner snow cover may partially alleviate these losses and offer some hope for Arctic ecological interactions. *GS*

https://doi.org/10.1038/s41558-018-0303-x

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