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CLIMATE SCIENCE

A bright side of precipitation

During the period 1986–2000, the world — or at least its terrestrial parts — became wetter. On average, the increase in precipitation over this time was 3.5 mm yr^{-1}. In other words, the hydrological cycle intensified, and Martin Wild and his colleagues set themselves the task of investigating the factors responsible (M. Wild, J. Grieser and C. Schär *Geophys. Res. Lett.* **35,** L17706, doi:10.1029/2008GL034842; 2008).

The strength of the main engine that powers the hydrological cycle depends on the balance of radiative energy at Earth's surface. That balance in turn depends, first, on the amount of solar radiation absorbed by the surface, and second, on the difference between the amount of thermal radiation being transmitted upwards into the atmosphere (upward radiation) and that being re-radiated back (downward radiation, which is controlled by the greenhouse capacity of the atmosphere). The sum of these fluxes determines the amount of energy that is available for the latent heat of evaporation, which drives precipitation. Any change in these fluxes induces changes in evaporation and precipitation, and thus in the intensity of the hydrological cycle.

For their calculations, the authors drew from two sources: the Global Energy Balance Archive and the Baseline Surface Radiation Network. The latter provides more sophisticated data, but started up only in the 1990s. Another consideration in the calculations was the serious but temporary

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effects on radiation balance of the huge emissions from the 1991 eruption of Mount Pinatubo in the Philippines, which lasted for several years.

After accounting for those effects, Wild *et al.* conclude that there has been a steady rise in net surface radiation of 0.2 W m^{-2} yr^{-1} between 1986 and 2000. They mention two possible causes. One is 'solar brightening' — a rise in surface radiation resulting from a more transparent atmosphere caused by a decrease in anthropogenic aerosols. The other is a more powerful greenhouse effect, increasing downward radiation.

As the authors point out, their study cannot provide a truly global picture because of the lack of data from the oceans. But their calculated rise in net surface radiation fits well with the estimate of energy flux required to drive the rise in precipitation. This provides a satisfying first-order numerical link between the changes in precipitation and radiation, recorded in independent data sets, over the 15-year period of their study.

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