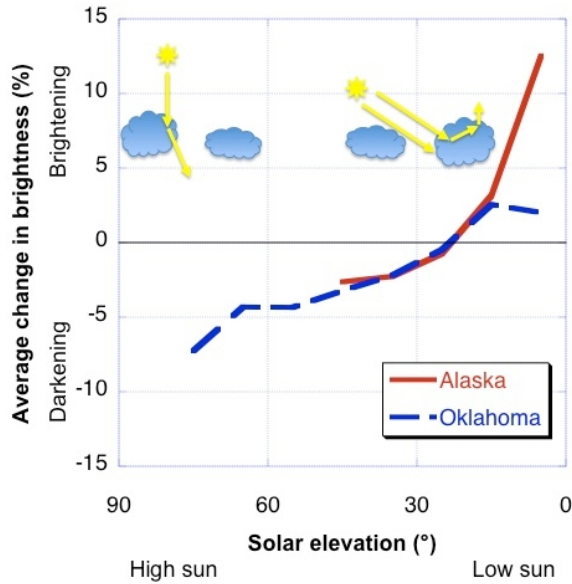


Cloud brightness changes caused by horizontal radiative interactions



This image shows the way horizontal radiative interactions influence cloud brightness in satellite images. The influence is calculated by comparing two sets of simulated satellite images, one that includes horizontal radiative effects and one that does not. Both kinds of simulations were carried out for the same yearlong set of cloud observations at two locations where instruments of the U.S. Department of Energy Atmospheric Radiation Measurement program provide highly detailed information about the clouds aloft. The figure shows that for high sun the dominant effect is sunlight escaping to the ground through cloud sides. This makes it easier for sunlight to pass through the cloud layer and reduces the light reflected to space, thus darkening satellite images. For low sun, however, horizontal effects that brighten satellite images become stronger. For example, cloud sides intercept sunlight and prevent it from reaching the ground easily in gaps between clouds. While earlier studies by researchers at the Climate and Radiation Branch and elsewhere discussed various aspects of these processes, the new dataset reveals their typical magnitude (also indicating, for example, that they are stronger than average for cumuloform cloud types and weaker for stratiform cloud types). Such information can help improve the accuracy of satellite data interpretation methods, which currently don't consider these processes in measuring cloud properties such as water content and particle size.

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