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Southern Ocean Eddies as Weather Makers

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Several hundred mesoscale eddies populate the Southern Ocean south of 30°S at any time, however, little is known about their effect on the overlying atmosphere. As these eddies feature sea surface temperature (*SST*) anomalies one can expect them to play a role in the coupling of the atmosphere and the ocean. Here we show based on satellite observations of about 600,000 eddies occurring between 1997 and 2010, that these ocean eddies significantly alter near surface wind, cloud properties and rainfall by several percent. Relative to the atmospheric variability, the magnitude of the anomalies related to ocean eddies represents ±13-15 % (wind, cloud fraction), ±6-10 % (cloud water content) and ±2-6 % (rain). This impact on the atmosphere is striking given the fact that oceanic eddies constitute non-stationary SST fronts of moderate size relative to the much larger atmospheric low pressure systems which are constantly passing by at these latitudes.
The spatial pattern of these changes is consistent with a mechanism labeled *downward momentum mechanism* in which the *SST* anomalies related to eddies modify the stability and thus turbulence of the atmospheric boundary layer. We will investigate the mechanisms and impact of the atmospheric modifications associated with ocean eddies in a regional high-resolution coupled atmosphere-ocean model (COSMO-ROMS) over the Southern Ocean.