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Cloud observations from ICESat, and comparison with ECMWF model-generated clouds

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The Geoscience Laser Altimeter System (GLAS) onboard the Ice, Cloud and Land Elevation satellite (ICESat) orbits the Earth at $\sim$7 km s^{-1} ground speed on a near-polar orbit. GLAS emits laser pulses at a 40 Hz rate, resulting in a backscatter cross section of the atmosphere with vertical resolution of 76.8 m and a distance between laser footprints of 175 m. Peaks in the laser's backscatter profile mark the boundary layer top, clouds and elevated aerosol layers. Averaging several backscatter profiles together before evaluation increases the signal-to-noise ratio and improves aerosol and cloud layer detection, though at the price of reduced horizontal resolution. The laser penetrates optically thin clouds, thus allowing the detection of multiple cloud layers.

GLAS-derived cloud observations from September 25th through November 18th 2003 are compared to model-generated clouds from two versions of the ECMWF model (CY28R3 and CY29R1). In CY29R1, the boundary layer parameterization has been changed to allow the formation of stratocumulus type clouds in the moist boundary layer. In previous cycles, stratocumulus clouds were generated by the convective parameterization. The boundary layer and convective parameterizations' ability to produce realistic stratocumulus and trade cumulus type clouds over the sub-tropical oceans is evaluated.