

The Marine Boundary Layer

The boundary layer over the tropical and subtropical eastern Pacific Ocean (within 30 degrees of latitude of the Equator) is often topped by clouds of some sort depending on the region. In what is known as the intertropical convergence zone (ITCZ), the clouds are convective in nature: cumulus and cumulonimbi (thunderstorms). To the north and south off of the Californian/Mexican and Peruvian coasts respectively, these regions are covered in a more or less constant stratiform cloud cover. In both of these regions, the boundary layer acts as a coupler between the surface and the clouds.

It's not hard to see that if a climate model were to accurately simulate clouds in these regions it would have to accurately represent the boundary layer here. An essential component of these models' schemes to calculate boundary layer turbulence is the determination of the height of the boundary between the boundary layer and the free atmosphere, commonly referred to as just simply the boundary layer height.

We compared the boundary layer height determined by the CCSM (Zeng et al. 2004) and the CFS with those derived from observed soundings during experimental ship cruises in the region. The CCSM had some notable differences, particularly in the region of stratiform cloud cover off of the Californian/Mexican coasts in August and September. CFS was generally found to produce an overestimated boundary layer height.

For more information on this research, check out:

Zeng, X., M. Brunke, M. Zhou, C. Fairall, N. A. Bond, and D. H. Lenschow, 2004: Marine atmospheric boundary layer height over the eastern Pacific: data analysis and model evaluation. *J. Climate*, 17, 4159-4170.