



A study on cloud cover in reanalysis datasets in tropical south India

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Clouds play a key role in Earth's energy and water budgets. This study examines the cloud cover changes in two nearer and distinct locations in tropical south India, one location is a near-coastal region in Thiruvananthapuram (8.52°N, 76.90°E) and another one in Western Ghats mountain ranges (10.15°N, 77.01°E). The study validated the following reanalysis product with Lufft CHM 15k ceilometer observations in both locations during 2017: ERA5, ERA-Interim and MERRA-2 reanalysis. ERA5 daily cloud cover data has the lowest RMSE (20 %) than other reanalysis datasets in these tropical locations. Correlation between daily ceilometer cloud cover observation and reanalysis datasets shows that ERA5 data has better temporal cloud cover anomaly (0.8) in the mountain location. All reanalysis datasets show significant correlation (0.01 level) with observation. RMSE (correlation) is higher (lower) in coastal region. Further, a long period cloud cover trend (1985-2016) in both locations are calculated from multiple reanalysis and ISCCP datasets. All datasets show a consistent and significant (0.01 level) increasing cloud cover in both locations. ISCCP Mean IR cloud amount (marginal) shows the highest increasing trend compared to reanalysis datasets (5.9 %). In the coastal location, the cloud cover increasing trend is much higher and all datasets agree well on it. A long period correlation analysis is performed between cloud cover variability in the study region and north Indian ocean SST to study their relation. Bay of Bengal SST is highly positively correlated with the cloud cover in the study region (significant at 0.01 level). This suggests that the observed increase in cloud cover has a strong relationship with the north Indian Ocean warming.