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Global patterns of solar influence on high cloud cover and role of sea surface temperature

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Climate change and global warming have become usual terms nowadays but mechanisms that could explain their causes are not understood. One of the main sources of uncertainty in climate projections is represented by clouds, which, due to various feedback, have an important influence on Earth's radiation budget. The cloud representation in General Circulation Models relies largely on constraints derived from observations. Solar impact on climate is largely unknown and some coupling mechanisms between solar and climate variability rely on the Sea Surface Temperature. We identified solar forced patterns in observed high cloud cover (HCC) based on associations with known fingerprints of the same forcing on cloud cover obtained from reanalysis data, on observed surface air temperature (SAT), sea level pressure (SLP) and sea surface temperature (SST) fields. The solar influence on HCC has maximum amplitudes over the Pacific basin, where high cloud cover anomalies are distributed in bands of alternating polarities, indicating a SST influence on high clouds through convection. The HCC structure induced by the solar cycle appears to be generated through both so-called "top-down" and "bottom-up" mechanisms of solar influence on climate. Clouds are dependent on the relative humidity which is strongly influenced by the dynamics and SST, thus we also review possible mechanisms connecting SST with clouds, solar radiation, cosmic rays, precipitations and aerosols.