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Can orbital drift of satellites introduce spurious trends? An example of NOAA-N series

A. Devasthale (1) and H. Grassl (1,2)

(1) Meteorologisches Institut, Universitaet Hamburg, (2) Max-Planck-Institut fuer Meteorologie

Sun-synchronicity is an important characteristic of many polar orbiting satellites. Being in a sun-synchronous orbit is especially essential to directly compare the data obtained from similar space instruments mounted on different satellites. The Advanced Very High Resolution Radiometers (AVHRRs) mounted on many NOAA satellites are a classic example of such system. These NOAA-N satellites have drifted in orbit resulting in change of equatorial crossing times during their life spans. We used 20 years of the daytime data from AVHRRs onboard NOAA-7, -9, -11 and -14 satellites during summer monsoon season over India to investigate the impact of orbital drift on frequency of convective cloud occurrence. We show that orbital drift significantly influences the frequency of cloud occurrence and may mask real trends. Due to orbital drift during the life span of satellites, observed cloud frequency shows positive correlation with the observation time over land and weak or neg ative correlation over the ocean. We suggest that this effect should be corrected for and in-depth investigations are needed to accurately assess changes in clouds propoerties (especially long-term trends) derived from sensors mounted on NOAA-N satellite series.