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J Aeronaut Aerospace Eng 2016, 5:2(Suppl)
http://dx.doi.org/10.4172/2168-9792.C1.014

2nd International Conference and Exhibition on

Satellite & Space Missions

July 21-23, 2016 Berlin, Germany

Secchi disk depth: Evaluation of an algorithm based on new visibility theory

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Secchi disk depth (Z_{SD}), a measurement of the maximum viewable depth of a white or black-and-white disk with a diameter about 30 cm when lowered into water, holds the longest (from at least 1880's) records of water transparency. This Z_{SD} data record is found not only important for the study of climate change, but also useful for seagoers. However, there has been no standard Z_{SD} product from all satellite ocean color missions. This may in part lie in that there was no robust algorithm to estimate Z_{SD} of global oceans from ocean color measurements, although numerous empirical relationships were developed for various locations. In addition, the classical visibility theory suggests that Z_{SD} is proportional to the inverse of (K+c), with K the diffuse attenuation coefficient and c the beam attenuation coefficient. Because c is significantly (2-5 or more) larger than K and that c could not be analytically retrieved from ocean color remote sensing, it has been perceived that there could be no analytical or semi-analytical algorithm for Z_{SD} from ocean color measurements. A recent study found that this classical interpretation of Z_{SD} is flawed, and a new theoretical relationship is developed for Z_{SD}. With concurrent measurements of Z_{SD} and remote-sensing reflectance (Rrs) of wide range of aquatic environments, the performance of the estimation of Z_{SD} with Rrs as inputs by the classical and the new approaches is evaluated. The excellent results of the new relationship indicate a robust system to produce global Z_{SD} from satellite ocean color measurements.

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Spatial and temporal features of particle precipitation at low- and mid-latitude zones

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EXOS-C observed precipitation of protons of energy 0.64-35 MeV and electrons of energy 0.19-3.2 MeV parallel to the geomagnetic equator in the low-latitude region, mid-latitude region, and the auroral region in order of increasing intensities during the time interval (1984-86). The detector efficiency shows that the locally mirroring particles (pitch angle 90 degrees) outnumber those of other pitch angles. In the low-latitude region, the electron peak flux lies in the L- range of 2-2.2, and the proton peak flux between L=1.8 to 2.0. In the mid-latitude region, proton peaks lies between L=2.2 to 2.4. The peak value of the particle population lies between 650 and 700 km. The particle population shows no longitude dependence within 140o to 360o. There is a shortage of data points in the other longitude range. In certain passes of the satellite, electron counting rates outnumber the proton counting rates and in some other passes the opposite effect occurs. Either altitude variation or a temporal variation or both may play a role for this opposing effect. No local time variation was found.

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