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Commentary

Brief Note on Polar Orbiting Environmental Satellites

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DESCRIPTION

Due to the rotation of the Earth, it is possible to combine the advantages of low-altitude orbits with worldwide coverage, using near-polar orbiting satellites that have an orbital aircraft crossing the poles. These satellites, termed Polar Orbiting Environmental Satelliite (POES) are launched into orbits at high inclinations to the Earth's rotation such that they pass throughout high latitudes near to the poles. Most POES orbits are circular to slightly elliptical at distances starting from 700 to 1700 km (435-1056 mi) from the geoid. At specific altitudes they travel at different speed levels. High inclination means that the subsatellite point moves north or south along the floor projection of the earth's axis. If the orbit is designed correctly, the subsatellite point may be largely in the day side of the planet at some point of time the complete orbit. Such an orbit is termed "sun-synchronous". Obviously, in order for this to happen, the orbital velocity of the saltellite (and its orbital altitude) might need to be phased with the rotation of the earth. The result is that the orbit of the satellite may be phased so that the satellite maximizes its rotational coverage of the day side of the planet.

The ground track of the POES is displaced to the west after every orbital period, because of the gravitaitonal forces effect and the rotation of the Earth. This displacement of longitude is a function of the orbital period. In essence, while the satellite revolves around each pole, the part of the earth at subsatellite point could be in sunlight or darkness throughout that whole period. Depending on the ground swath of the satellite, it is possible to regulate the period and as a result the longitudinal displacement, in this way as to ensure the observation of any point on the Earth within a particular time period. Depending on orbital altitudes, angular velocities and inclinations, polar orbiting satellites may be sun-synchronous, that is, they cross the equator south bound about 11 degrees. Westward with each trip across the world, so they move some reference position (e.g., the equator) at equal nearby time. This time is generally among mid-morning and mid-afternoon on the sunlight position of the orbit.

CONCLUSION

Sun synchronous satellites pass over any given latitude range at almost equal to nearby time during each orbital pass. Thus satellite image ground swaths at about the same solar time at some point of each pass, so that lighting remains more or less uniform. Certainly the clouds change with each and every orbit, but their broad patterns and positions remain frequently unchanged in the short orbital periods involved. From this method, you can make a daily mosaic from the ground swaths, which is a good preferred summary of worldwide climate patterns for that period. This same orbital configuration applies to Landsat, SPOT and some of the other land observers. In addition, for a given latitude range and season, sunsynchronous satellites observe the Earth surface with a nearly constant sunlight ratio. This feature is useful for the measurements in the visible wavelengths, and also for thermal conditions consistent with the diurnal cycle. A dawn-dusk orbit is a unique case of a sun-synchronous orbit in which a satellite always trails the shadow of the Earth emit through the Sun.

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