DSCOVR, a new approach to Earth Sciences from Space

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The L-1 and L-2 Earth-Sun Lagrange points mark positions where the gravitational pull of the Earth and Sun precisely equals the centripetal force required to rotate with the Earth about the Sun with the same orbital period as the Earth. Therefore, a satellite maintained at or near one of these Lagrange points would keep the same relative position to the Sun and the Earth and be able to observe most points on the planet as the Earth rotates during the day. L-1 and L-2 are of particular interest because a satellite at either location can easily be maintained near the Sun-Earth line and views, respectively, the entire daytime hemisphere or the entire nighttime hemisphere. Synoptic, high temporal-resolution observations would be obtained as every point on the planet transits from sunrise to sunset (L-1) or from sunset to sunrise (L-2). A pair of deep-space observatories, one at L-1 and one at L-2, could simultaneously observe almost the entire Earth's surface and atmosphere. Such unique attributes are incorporated in the Deep Space Climate Observatory (DSCOVR) that will systematically observe climate drivers (radiation, aerosols, ozone, clouds, water vapor) from L-1 in a way not possible with other satellites. The combination of Solar Lagrange Points (SLPs), LEO, and GEO satellites would certainly provide a powerful observational tool as well as enriched data sets for Earth sciences. Such synergism is greatly enhanced when one considers the potential of utilizing LEO, GEO, and SLPs satellites as an integrated observational system. For example, a satellite at L-1 will view the Earth plus the Moon while simultaneously having in its field of view (at one time or another) all Earth-orbiting satellites. This view offers the opportunity to use the Moon as a calibration reference that can in turn be shared with all other Earth observation satellites. In other words, the deep-space observatory can become an important link between LEO and GEO satellites while at the same time providing the data necessary to build an integrated Earth observational system. Such synergism would certainly help advance Earth sciences and greatly enhance the return for the nation's investment in space. A synergistic, integrated system composed of LEO, GEO, and SLPs platforms is likely the way of the future.