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Station motion model for the diurnal/semidiurnal atmospheric pressure loading effect

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Geodetic techniques and analysis procedures are such that sub-daily station displacements need to be considered in the station motion model. Currently, sub-daily parameters include the earth tides and ocean loading effects among other things. In addition, the diurnal heating of the atmosphere induces surface pressure oscillations at diurnal and higher harmonics, and these "atmospheric tides" also induce periodic motion of the Earth's surface. For the 24-hour S1 tide, maximum deformation occurs in low latitudes over large continental land masses, with displacements of order 2 mm peak-to-peak. For the 12-hour S2 tide, deformation is more zonally symmetric, with maximum deformation of order 3 mm peak-to-peak along the equator. For the 8-hour S3 tide, deformation is smaller but potentially detectable. All these tides have significant seasonal modulations. The air tides over the oceans induce a highly dynamic ocean response. The response at S2 is already included in most models of the S2 ocean tide (the so-called radiational component). The response at S1 has been generally ignored, but recent modeling efforts (e.g., Ray & Egbert, 2004) can now be adopted to account for this effect. In this talk, we analyze the effects of the atmospheric tides on geodetic station positions and discuss procedures for implementing the effect into the station motion model.