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Atmospheric loading effects on time-variable gravity and surface displacements

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Besides solid Earth tides and ocean tidal loading, the atmosphere is the major source of global Earth's deformation over a large frequency domain (from sub-daily tides to seasonal timescales). With the help of Love numbers, or the Green's function formalism (Farrell, 1972), and global atmospheric datasets (surface pressure or the complete 3D structure) provided by meteorological agencies, it can be nowadays precisely modeled on operational basis.

We present the computations of time-variable gravity and surface displacements, and show the improvement in terms reduction of the noise signal in GRACE KBBR residuals & surface displacements (GPS, SLR and VLBI).

We emphasize the differences between the classical 2-D approximation (using only surface pressure) and the full 3-D approach (using global vertical profiles of temperature and humidity).

Atmospheric loading computations also require a model of the ocean response to air pressure. We show the differences between the classical inverted barometer approximation and non-tidal barotropic models forced by air pressure and winds (e.g. MOG2D).