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Atmospheric tides in variations of VLBI station positions

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The deformation of the Earth surface caused by atmospheric tidal mass variations is small compared to loading associated with ocean tides or solid Earth tides. Yet, due to an ever-growing data base of Very Long Baseline Interferometry (VLBI) observations, atmosphere-induced effects in variations of station positions can be estimated. We determine daily and sub-daily harmonic signals in station time series of 20 years, from 1995 to 2015, and find reasonable amplitudes for a number of sites. Particular emphasis is given to station Katherine in Australia, where a strong atmospheric signal at the diurnal frequency band is detected. We compare the amplitudes against those from loading providers, including TU Wien, Goddard Space Flight Center (GSFC) and the Global Geophysical Fluid Center (GGFC) with focus on the radial component. In this study, the analysis of VLBI observations is performed with the Vienna VLBI Software (VieVS). The amplitudes are estimated as global parameters from 10 years of VLBI observations as well as from special session-wise solutions with hourly estimates of station coordinates. In the latter case we had to change the standard parameterisation for the tropospheric delays in order to avoid fictitious deformation signals due to correlation. Furthermore, special attention is paid to tidal oceanic effects because they cannot be fully de-coupled from the atmospheric counterparts.