Loading of the Earth's crust engendered by variations of global atmospheric pressure can displace the positions of geodetic sites by more than 1 cm, both vertically and horizontally, on seasonal to sub-diurnal time scales. Rigorous computation of atmospheric pressure loading (APL) displacements requires knowledge of the surface pressure anomaly over the Earth’s surface. In order to develop the Vienna-APL model, we generate the pressure anomaly data by subtracting reference pressure values from surface pressure data, and we then convolve these anomaly data with the Green’s functions. For this purpose, we define reference pressure values according to the newly developed Global Reference Pressure (GRP) model (http://ggosatm.hg.tuwien.ac.at/LOADING/REFPRES/global_reference_pressure_memo.pdf). Operational analysis and re-analysis data sets from the European Centre for Medium-Range Weather Forecasts (ECMWF) with a horizontal resolution of 1° are used to calculate six-hourly tidal components of the 3D displacements.

We analyze baseline measurements from Very Long Baseline Interferometry (VLBI) observations (1990-2009) and restrict ourselves to those baselines measured more than 100 times. The use of the Vienna-APL model improves the variance of the baseline repeatability by 10% and reduces the root-mean-square (RMS) of the baseline length residuals on 111 of the 165 baselines investigated. Even if the model might not be accurate enough for some stations near the coast, we conclude that, in general, the model is suitable for correcting the load effects on space geodetic observations. Users can freely access the Vienna-APL correction values for all VLBI sites as well as for the nodes of a global 1° grid at http://ggosatm.hg.tuwien.ac.at/.