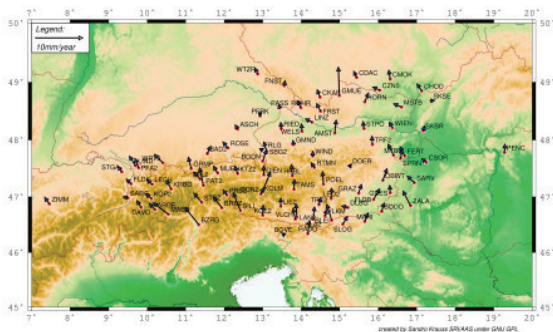


## Trafelberg on the move – Long-term and periodic variations of its position

The GNSS-station TRFB/TRF2 (Trafelberg, Conrad Observatory) is permanently observed within national and international networks. The coordinate time series are used to determine the 3D-velocities in the space domain as parameters for long-term variations and to separate periodic variations within a year (frequency domain).

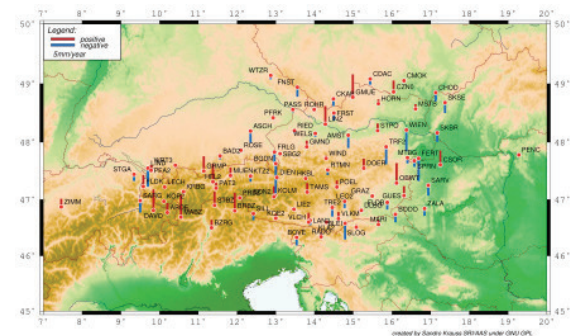
The GNSS-station TRFB (Trafelberg) started its observation in April 2004. Because of a change in the height reference the station had to be renamed to TRF2 in January 2008, but remained physically untouched. The total time series of observations covers more than seven years, therefore. From the weekly average coordinates long-term changes are determined by linear regression. They are interpreted as velocities in a 3D-space. The velocities are determined within the ITRF2005 reference frame, the international standard between 2006 and 2011. For a better interpretation these velocities are referred to ETRF2000 by subtracting the rotation of the Eurasian plate. The velocities are usually split in horizontal (Fig. 1) and vertical (Fig. 2) ones. The reasons are the separation into physical effects (general tectonic, local soil movements, troposphere) and equipment effects and other modelling problems which affect mainly the height component (Titz et al. 2010).



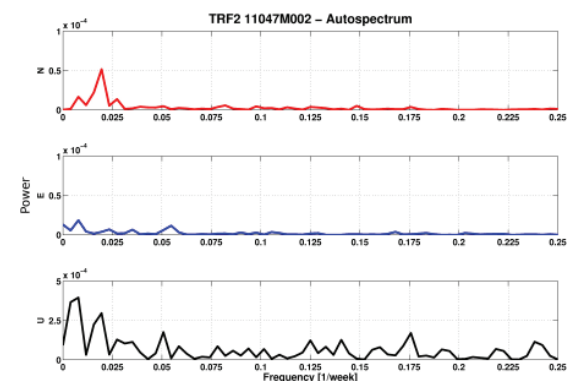
**Figure 1:** Residual horizontal velocities of the Eastern Alps with respect to the Eurasian Plate.

The precision of the velocities is dependent on the length of the time series. For TRFB/TRF2 the horizontal precision is estimated to be better than 0.5 mm/year. The vertical velocity has less precision for several reasons. First, the GNSS geometry in mid-latitudes increases errors in the vertical three times larger than horizontal ones. Second, most of the model errors (antenna, troposphere and

ionosphere) influence mainly the vertical component. Third, the periodic effects (mainly troposphere) are concentrated on the vertical component. Especially TRF2 shows a strong half-a-year periodic signal in the vertical, probably caused by large seasonal weather fronts (Fig. 3).



**Figure 2:** Residual vertical velocities of the Eastern Alps with respect to the Eurasian Plate.



**Figure 3:** Spectrum of coordinate time series of TRF2.

**References:** H. Titz, N. Höggerl, E. Imrek, G. Stangl, Realisierung und Monitoring von ETRS89 in Österreich, Österreichische Zeitschrift für Vermessung und Geoinformation, 98. Jg. 2/2010, 52-61.

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