Introduction
A new prediction model for high-frequency (diurnal and sub-diurnal) Earth rotation parameters (ERP) is highly desirable as good a priori models increase the accuracy in the analysis of space geodetic observations. We describe the work flow of the derivation of such a prediction model and assess the quality of different approaches.

Project SPOT
We have started a project SPOT (funded by the Austrian Science Fund FWF) to develop an updated prediction model for high-frequency ERP based on ocean tides. We use recent ocean tide models, such as EOT11a, FES2012 and HAMTIDE11a and refine the angular momentum transfer functions using a realistic Earth model (see talk by J. Hagedoorn et al.).

Ocean tidal angular momentum
As we use the angular momentum approach, we need to derive the mass term (related to mass redistributions in the oceans) and the motion term (related to relative motions of the ocean particles). The mass term can be calculated by integrating tidal heights, the motion term by integrating tidal currents. However, empirical models only include tidal heights and thus, tidal currents need to be derived. Shallow water equations provide the basis for an algorithm to estimate barotropic horizontal currents from tidal heights.

Admittance – best model
Gridded tidal heights can be interpolated using their tide generating potential as the admittance (ratio of tidal height and tidal potential) is a slowly varying function of frequency (Munk & Cartwright, 1966). We interpolate tidal currents as well as heights according to the admittance theory and find the best results when including 20 tides (18 FES2012 tides also existing in the IERS model and 2 interpolated „minor“ tides) compared to 71 tides in the IERS Conventions 2010 recommended model.

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Results – Estimation of tidal currents
FES2012, 1°, weighting c = 1000, Arakawa C-grid

Comparison – VLBI analysis
The analysis was performed using the Vienna VLBI Software. We use (1) VLBI sessions from 2011 to 2013 (R1, R4, CONT11) and (2) CONT11 only. Nutation offsets were calculated prior to the estimation of high-frequency (one hourly) ERP. The VLBI sessions were analyzed using (1) our FES2012 „best“ model; (2) the IERS Conventions model; and (3) an empirical model (T. Arzt, IGG Bonn; CONT11 data only).

To compare these models, we calculate the Fourier spectrum and subtract the Fourier amplitudes.

Results – VLBI analysis
We compare our „best“ model to the IERS Conventions 2010 model and an empirical model (T. Arzt, IGG Bonn) according to the flowchart shown. The Fourier amplitudes are estimated as follows: Left: least squares adjustment at 18 frequencies included in both models and separable (time span long enough). Right: FFT. When comparing the FES2012 model with the IERS Conventions model (left column), we find improvements for the y-component both for the diurnal and semi-diurnal tides. Also the diurnal \(\Delta UT1\) residuals decrease when using the new model. For the semi-diurnal \(\Delta UT1\) there seems to be an issue for one partial tide since the other 11 frequencies in that band show a good agreement. For the x-component we find a degradation, however not as much as the improvement in the y-component.

Similar figures are found for the CONT11-only comparison (right column).

Conclusion
We successfully derive horizontal oceanic currents from tidal heights using an algorithm based on the shallow water equations. However, the best model in terms of small VLBI residuals is found when using the admittance approach for both heights and currents of minor tides. The comparison to the IERS Conventions model and an empirical model is done using the Vienna VLBI Software. The FES2012 „best“ model performs on a comparable accuracy level as the other models, improvements are found for \(p_y\) (diurnal and semi-diurnal) and \(\Delta UT1\) (diurnal).