INTRODUCTION
The quality of monthly gravity fields from GRACE data is limited by noise of the onboard instruments (GPS, K-Band, accelerometer and star cameras) and deficiencies in the background models (third bodies, tides, de-aliasing: AOD18). The Celestial Mechanics Approach (CMA) absorbs the background model deficiencies by constrained piecewise constant stochastic accelerations over 15 minute intervals, estimated together with all other orbit parameters and the gravity field coefficients. An analysis of the quality of the resulting monthly gravity models reveals that especially during times of high solar activity this measure is not sufficient to generate high quality gravity field solutions.

This poster analyzes the carrier phase residuals of the kinematic orbit determination and the K-Band range-rate residuals of the combined orbit determination using the previously determined kinematic positions and the Level-1b K-Band range-rate data as observations.

KINEMATIC ORBIT RESIDUALS
Orbit parameters and stochastic accelerations were determined in a fit of daily arcs to the kinematic orbits. The static gravity field GOCO03Sp (derived from 7 years of GRACE + 1 year of GOCE data) was used up to degree 120 in the force model. As opposed to Figs. 1a,b the resulting residuals reflect observation noise as well as model errors (Figs. 5a,b). Note that the constraints on the stochastic accelerations were kept constant over the whole time period.

RANGE-RATE RESIDUALS
As soon as K-Band range-rate observations are taken into account, the relative accuracy in along-track between the resulting reduced dynamic orbits of GRACE A and B is dominated by the K-Band accuracy. The range-rate residuals (Fig. 6) show a clear dependency on the inter-satellite distance (Fig. 7). A noise increase before 2004 and after 2012 hints at an impact of the high solar/ionosphere activity. The general increase of noise during the mission may also be due to inadequate parametrization at low satellite elevation (Fig. 8).

CONCLUSIONS
The fact that we have to down-weight GPS indicates some model deficiencies that lead to conflicts between GPS and K-Band. Before more advanced techniques for observation dependent weighting like variance component estimation can be applied, these model deficiencies have to be resolved. We assume that we either have to decouple GPS and K-Band by • the introduction of empirical K-Band parameters or • empirical covariances that are derived from the K-Band range-rate residuals.

DIVISION: All views expressed are those of the authors and not of the Agency.

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