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The assessment of minor tidal constituents in ocean models for optimising the ocean tidal correction

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Satellite altimetry observations have provided a significant contribution to the understanding of global sea surface processes, particularly allowing for advances in the accuracy of ocean tide estimations. Accurate estimations of ocean tides are valuable for the understanding of sea surface processes from along-track satellite altimetry. Ocean tide models have done a suitable job in providing these estimations, however, difficulties remain in the handling of minor tidal constituents. The estimation of minor tides from altimetry-derived products proves difficult due to the relatively small signals of these tides and due to the temporal sampling of the altimetry missions meaning a long time series of observations is required. This is generally solved by models and tidal prediction software by using admittance theory to infer these minor constituents from the more well-known and better estimated major constituents. In this presentation, the results of a recent study that looked at the estimation of several minor constituents directly from tide models compared to the inferred version of these tides are presented. The model used for the direct estimations and the inferences is a regional version of the Empirical Ocean Tide model (EOT) which is a data-constrained model derived from multi-mission satellite altimetry. The resultant estimations from these two approaches are compared to two global numerical tide models (TiME and FES2014) and in situ tide gauge observations (from the TICON dataset). Based on the study of eight tidal constituents, a recommendation of directly estimating four tides (J1, L2, μ2 and ν2) and inferring four tides (2N2, □2, MSF and T2) is given to optimise the ocean tidal correction. Following on from this, a new approach of merging tidal constituents from different tide models to produce the ocean tidal correction for satellite altimetry that benefits from the strengths of the respective models is presented. This concept allows for the benefit of using data-constrained tide models in the estimation of the major constituents as well as the use of numerical models in providing a greater number of minor constituents, to be combined to provide a more optimised estimation of the full tidal signal.