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Future satellite-instruments with emphasize on water vapour remote sensing

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This poster summarizes concepts of future European satellite-instruments and their contribution to the continuation of the retrieval of water vapor in the near infrared. It shows the technical built-up of five spectrometers: OLCI (Ocean- and Land Color Instrument) on Sentinel-3, the follower of MERIS on ENVISAT, and Sentinel-2, both part of the GMES (Global Monitoring and Security)-program; METimage on MEtop, FCI (Flexible Combined Imager) on the follower of the second generation of EUMETSATs geostationary satellites MTG (Meteosat Third Generation), and ENmap, the German hyper-spectral earth observation satellite. We focus on comparisons of the spectral-, spacial- and temporal resolution of the instruments with emphasize on the channel settings. Most of the concepts are follow-on missions of existing and operating instruments. Improvements and consistent characteristics are presented and discussed.
A quantification of uncertainties of retrievals using measurements of the future instruments was carried out. The optimal estimation theory, introduced by C.Rodgers, was used to estimate the error of an ideal total water vapor column retrieval for a number of different atmospheric cases. The errors range from 100% in very dry cases to 2% in humid cases with a very high surface albedo. Generally the uncertainties increase with higher water vapor column content due to water vapor saturation and decrease with a brighter surface albedo. Uncertainties decrease with higher aerosol optical depth apart from very dark surfaces, such as oceans.