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Author: Dr. Albrecht von Bargaen  
DLR (German Aerospace Center), Germany, albrecht.von-bargaen@dlr.de

Mrs. Godela Rossner  
DLR (German Aerospace Center), Germany, godela.rossner@dlr.de

THE GERMAN SPACE PROGRAMME AND CLIMATE CHANGE

**Abstract**

Three pillars are the base of Earth Observation in the German Space Programme. First, the German Space Agency at DLR is continuously supporting the European space ambitions with the strongest contributions over the past. This includes the high commitment to ESA's Earth Observation programme, EUMETSAT's Meteorological and operational programme, and the dedication to the European Copernicus programme including its services Copernicus Climate Change and Atmospheric Service. Another and important focus is set to National missions including land-surface Earth Observation missions such as the SAR missions TerraSAR-X, TanDEM-X and the hyperspectral imager EnMAP. A long-standing cooperation with NASA and German research institutes allowed the implementation and operation of the very successful GRACE and GRACE-FO missions providing us insight to the Earth's gravity, and hence the change of ice masses. A cooperation with CNES will put the lidar mission MERLIN into space in the future with the unprecedentedly provision of unbiased Methane concentrations in the atmosphere allowing the derivation of emission fluxes.

In this presentation, we show what kind of climate change related applications can be served by the German Space Programme. We like to recall following examples. The combination of TerraSAR-X and TanDEM-X unprecedented data can be used to determine forest height and biomass. However, the high spatial resolution of EnMAP will allow to demonstrate the derivation of vegetation related quantities paving the way for time-series from future hyperspectral imager missions. The derivation of un-biased Methane concentration will enhance the accuracy of this product derived from missions used for global monitoring and finally the Global Stocktake. The planned upcoming gravity mission will support the continuity with respect to GRACE and GRACE-FO.

Importantly, we discuss the mission objectives and their products under the light of the goals of the Paris climate agreement. We carefully check out how they can serve the needs of mitigation, adaptation, and loss and damage, and will show opportunities for systematic usage with emphasis to future mission planning. Finally, DLR offers as research entity also ground-based and airborne-based means. This will allow us to look also how to combine space-based and other based means. Additionally, the combination of data from several Earth Observation mission sensors will also allow to provide new insights. Interesting examples from different sensors but especially the EnMAP mission will be given.