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Geodetic GNSS measurements as a basis for geodynamic and glaciological research in Antarctica

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For about twenty years our institute has been carrying out geodetic GNSS measurements and has been actively working in international collaboration for Antarctic research. Episodic GPS (and later GNSS) measurements of all contributing nations enter the "Database of the SCAR Epoch Crustal Movement Campaigns" which is being maintained at the institute in the framework of SCAR-GIANT. GNSS measurements form a basis for the realization of the International Terrestrial Reference Frame (ITRF) and its densification in Antarctica. Linked to respective products of an ongoing activity to re-process GNSS data of globally distributed stations a consistent and precise TRF realization can be reached. We will give an overview on the latest developments and the subsequent applications for geodynamic and glaciological investigations in Antarctica. Complementary to continuous GNSS observations episodic GNSS measurements have the potential to provide independent data on vertical deformations, which can be used to investigate the present-day ice-mass balance and to refine models of the glacial-isostatic adjustment. Repeated and properly referenced GNSS measurements at the ice surface yield ice-flow velocities and local ice-surface height changes. We will present latest results, e.g. for the Amundsen Sea sector, the subglacial Lake Vostok region and near-coastal regions of Dronning Maud Land or Enderby Land. Thus, it will be discussed how geodetic GNSS measurements form an important and indispensable basis for geodetic Earth system research with the focus on Antarctica.