The Geodynamic Observatory Moxa / Thuringia: History, present status and future plans

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The Geodynamic Observatory Moxa was started in 1964 as a seismological station of the Institute of Geodynamics as part of the Central Institute of Physics of the Earth, Potsdam. Compared to the soft underground in Potsdam the geological conditions in the Thuringian Forest allowed for better seismological observations.

The observatory consisted of a system of two galleries (E/W and N/S) behind a big observation laboratory which is partly covered by rock, and an observation chamber at the end of the tunnel system. In addition to different seismometers (an old Wiechert-seismograph and modern electrodynamic seismometers) two long quartz-tube strainmeters (26 m each) were installed along the galleries.

Starting in 1996 many changes and upgrades were applied. First of all, a horizontal borehole was drilled to connect both galleries with a laser strainmeter. Secondly, an Earth Tide gravimeter was installed (LCR-ET 18), and boreholes were drilled for ASKANIA borehole tiltmeters. In 1999 a superconducting gravimeter was installed in a part of the big seismometer lab. With this instrument Moxa joint the Global Geodynamics Project (GGP), a network of superconducting gravimeters worldwide. It turned out that this observatory was one of the quietest stations of the network.

Two main projects were organized: First, a detailed study of the groundwater situation and its effect on gravity was carried out. The results revealed that the corrections of groundwater variations improved not only the separation of the Chandler wobble in gravity, but allowed also the detection of the global water cycle on the microgal level. This was also verified for other stations. The second project concerned the tilt changes caused by water injection at the basis of a 4 km deep borehole at the site of the German continental deep drilling project. The tiltmeters were tested in Moxa, and the obtained results revealed that the water injection experiment caused small tilt changes which could be allocated to stress changes at the bottom of the borehole.

During the past two years the quartz-tube strainmeters were amended by laser strainmeters. Further, the construction works for a new gravity sensor were started. In parallel, a new borehole was drilled for tests of optical fibres and hydro experiments. Last but not least, the 50th anniversary of the observatory in the year 2014 is in preparation.