Astronomers in Potsdam plan telescope in Antarctica

EU Control Program Conference in Tenerife

Starting 2012 a robotic 60cm-twin telescope is planned in Antarctica by the Astrophysical Institute Potsdam (AIP), the Alfred-Wegener-Institute Bremerhaven and 6 further cooperating institutes in Europe and Australia. The telescope shall look for extra-solar planets in observation rounds lasting three months per year. From 26th to 29th March a conference in the EU Control Program ARENA („Antarctic Research, a European Network for Astrophysics“) takes place on Tenerife. Here astronomers, technicians, the operators of the Italian-French CONCORDIA-Station already in operation and logistic teams meet. Thereby the basic conditions for the construction of telescopes and their future operation are discussed and planned.

The twin telescope called ICE-T, meaning „International Concordia Explorer Telescope“, in many ways is unique and thus has to be planned well. The telescope is going to be situated on the so-called Dome C, a high plateau in East Antarctica measuring 3,280 meters and will do fully automatic optical high-precision photometry. Dome C is a site between heaven and earth with an environmental temperature between -30°C in summer and up to -80°C in winter as well as practically no air humidity, so it is rather uncomfortable. ICE-T is going to look for extra-solar planets around stars resembling our sun and at the same time record earthen atmospheric data without anybody having to be at the site. The simultaneous use of a telescope for atmospheric and astrophysical sciences is so far unique too.

The Antarctic plateau fits perfectly because it offers unique environmental conditions for astronomical observations. There is clean and extremely dry air, little wind, no usual day/night cycles with the accompanying periodic air warming and no air contamination. Antarctica is a refrigerator measuring 4,000 km. The sky is extremely clear and thus sighting is probably the best worldwide. The CONCORDIA station was put into operation by Italian and French scientists in 2005 who with their experiences help to advance the project in line with the EU. However, a telescope in Antarctica is a bit problematic. The material is exposed to high thermal strains, similar as in space. There are microscopically small ice particles, so-called diamond dust which may settle on the telescope optics. But the biggest problem is the physical isolation in winter. Winter in Antarctica is one long night. The station is 1,000 km away from the coast and thus in winter is inaccessible for 9 months or can be reached only in extreme emergences and under high costs. Moreover, due to temperature librations of 20–30°C at night ground clouds may form which may cause a defocusing of the telescope. But these problems are known and thus are included into the planning. Therefore ICE-T will be a robotic telescope modelled on STELLA and will be equipped with artificial intelligence. For 3 months per year, that is one night, one section of the sky will be observed in two bandpasses continually without it becoming day in between. „ICE-T is going to make the most precise photometric observations ever been done from the earth.“ explains the head of the project, Prof. Klaus G. Strassmeier, one of the two scientific directors of the AIP and responsible for the research area Cosmic Magnetic fields. About 1.3 million stars in a sky section of about 65 square degrees are simultaneously searched for brightness librations caused by the transit of an extra-solar planet in front of the disc of its mother star. Thereby its magnetic activity is also measured. In case of a dysfunction the telescope turns to the Southern hemisphere and thus still records 100,000 stars. The next difficulty is the question where to put all this data? In Antarctica there is no internet and no optical fiber cable to the coast and thus the data have to be stored at the telescope until the next dawn when they can be physically collected by an expedition. We talk about huge data amounts here ranging from 200 terabytes (200 million

megabytes) which even after compression still measure 70-100 terabyte and thus have to be reduced again. An automatic data reduction program at the site masters this task. The project is also funded within the cartel proceedings of the Leibniz-Gemeinschaft.