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Site monitoring at the SRT

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Abstract. The Osservatorio Astronomico di Cagliari (OAC) space geodesy group collaborates with the space geodesy group of the Istituto di Radioastronomia (IRA) in Bologna, forming a joint group involved in the SRT project. Planned activities, concerning geodetic and site-related surveys, will be briefly treated.

1. Introduction

Site testing and monitoring together with geological site stability control will be useful activities for the Sardinia Radio Telescope. In this context a joint group, consisting of OAC and IRA personnel, is planning and carrying out several routine activities such as:

- new geodetic GPS receiver(s) monumentation;
- local geodetic network definition;
- new weather station set-up;
- 3D wind profile analysis;
- hydrological survey;
- path delay analysis.

The local network will allow us to tie the VLBI and GPS centres and to monitor the site stability.

2. Local geodetic network

The long-term stability of a radio telescope may depend on (local) ground settlings that may cause variations of the antenna positioning and the VLBI reference point. In order to determine the stability of the site on a local scale, a small geodetic network will be defined and measured. The group is now attending tp the definition of such a network, taking into account many aspects arising from the conformation and the geological nature of the site (shallow bedrock of high quality should be preferred for the geodetic monuments). The results of several geognostic investigations (seismic refraction, core recovery boreholes, loading tests and packer and variable permeability test in boreholes) carried out in the last years are available.

Triangulation and multilateration of the reference network will be performed routinely by means of classic geodetic techniques, static GPS, kinematic GPS (KGPS) and real-time kinematic GPS (RTK).

A new GPS/GLONASS antenna-receiver pair will soon be bought and in the next months a new geodetic GPS monument will be installed at the SRT site following International GPS Service (IGS) recommendations (Combrinck & Schmidt 1998).

We plan to produce daily geodetic solutions: the total zenithal delay will be directly esti-

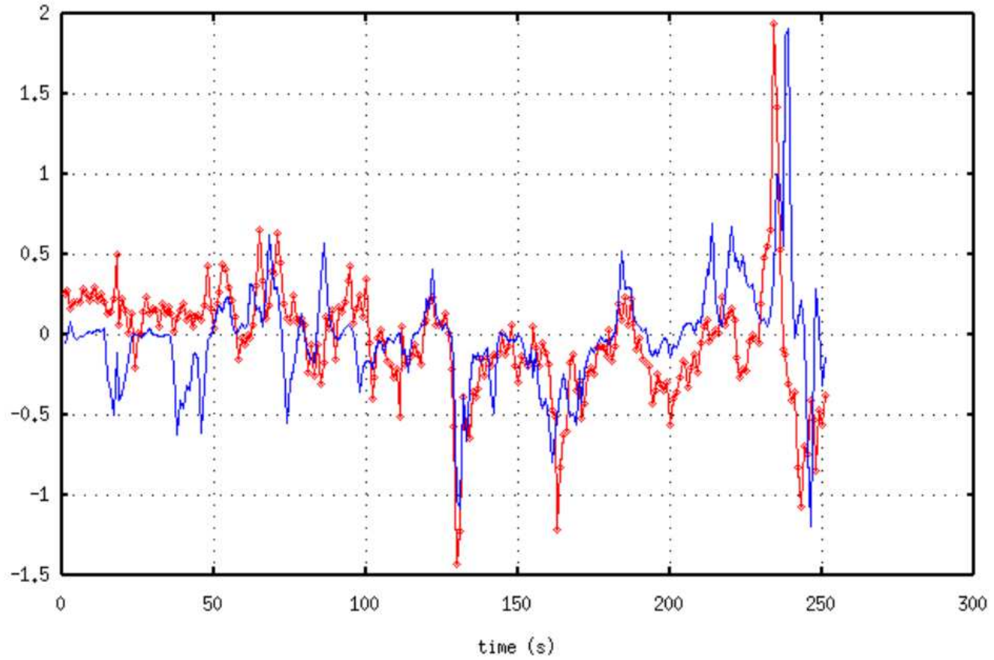

Fig. 1. Comparison between pressure transducer (diamonds) and 3-D anemometer (continuous line), vertical scale is in arbitrary units.

mated from GPS data and both hydrostatic and wet path-delay will be accessible. In an operative realistic scenario the path delay will be evaluated in near real-time; this parameter together with metrologic and weather sensors will allow one to infer the site-related environmental status of the SRT.

3. Weather station

The primary task of the weather station is to routinely monitor the relevant weather parameters at the SRT site and the creation of a time-series archive. During its life the station will provide the weather support for the observations as well as for the radio telescope safety: it is well-known that extreme adverse weather conditions may affect (or halt) the ground-based observations.
The chosen instrumentation complies with the most severe construction standards, and has already been tested in other astronomical contexts (Porceddu et al. 2002). A special device will be used for the wind measurements: a 3-D ultrasonic anemometer. This instrument has two special features:

- it is able to provide a 3-D wind field, i.e. the upwelling convective flux can be detected;
- it can sample wind components at high rates, just over 10 Hz.

The SRT is designed to operate at frequencies up to 22 GHz with a minimal amount of metrologic instrumentation, and up to 100 GHz with a full complement of instrumentation. A metrologic wind pressure sensor system is required for good pointing accuracy whenever the wind is in excess of *precision* wind conditions.
A set of 3-D ultrasonic anemometers may be a *cheap* candidate for substituting the pressure sensor system based on pressure transducers. The output of the two sensors (pressure and wind velocity projected to the pressure gauge axis) are compared in Fig. 1, where the wind

velocity is represented by means of a quadratic law.

References

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