

A Fourier Tachometer at Dome C in Antarctica

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Abstract

Dome C appears to be the ideal place for ground-based asteroseismic observations. The unequalled weather conditions yield a duty cycle as high as 88% over 3 months. We intend to install there the Fourier Tachometer SIAMOIS. Spectrometric observations with SIAMOIS and a dedicated small collector will be able to detect the $\ell = 3$ oscillation modes that cannot be observed in photometry, in bright low-mass stars.

Future ground-based asteroseismic observations

It is well known that asteroseismic observations require long duration time series with the highest duty cycle. In parallel to the CoRoT mission, the next spectrometric ground-based observations will have to reach a high duty cycle. Then, they will give access to complementary information ($\ell = 3$ modes, hence the small separation between $\ell = 1$ and 3 modes). SIAMOIS, a Fourier Tachometer to be installed at Dome C, will observe bright low-mass targets that will not be observed by CoRoT.

Fourier Tachometry (FT) appears to give excellent performance (Mosser et al. 2003) for a much lower investment than échelle spectrographs; FT was chosen for the GONG helioseismic network after a long study of competing measurement strategies. The multiplex advantage of FT makes possible to observe simultaneously different targets with different telescopes fibre-linked with the same instrument. With SIAMOIS, we intend to observe with two dedicated 40-cm telescopes.

Observations at Dome C

Dome C appears to be an exceptional site for astronomy (Agabi et al. 2006). Monitoring of the clear sky fraction has shown that the duty cycle during the 100-day long polar night reaches 86%. An asteroseismic network such as the proposed SONG project (<http://astro.phys.au.dk/SONG/>) with nodes typically at the same place as the 6 GONG units cannot provide such a high duty cycle (Fig. 1, from Mosser & Aristidi 2007). As a consequence, Dome C is certainly the best ground-based site for continuous long-duration observations.

The scientific programme at Dome C includes main targets, to be observed for 90 days with a duty cycle better than 88%, and secondary targets to be observed for 1 month, just before and after the polar night, with a duty cycle better than 60%. Hence, SIAMOIS offers a specific scientific program after CoRoT, for more than 6 winters. SIAMOIS is currently in phase A; first observations at Dome C are projected for 2011.

References

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- Mosser B., Maillard J.-P., Bouchy F., 2003, *PASP*, 115, 990

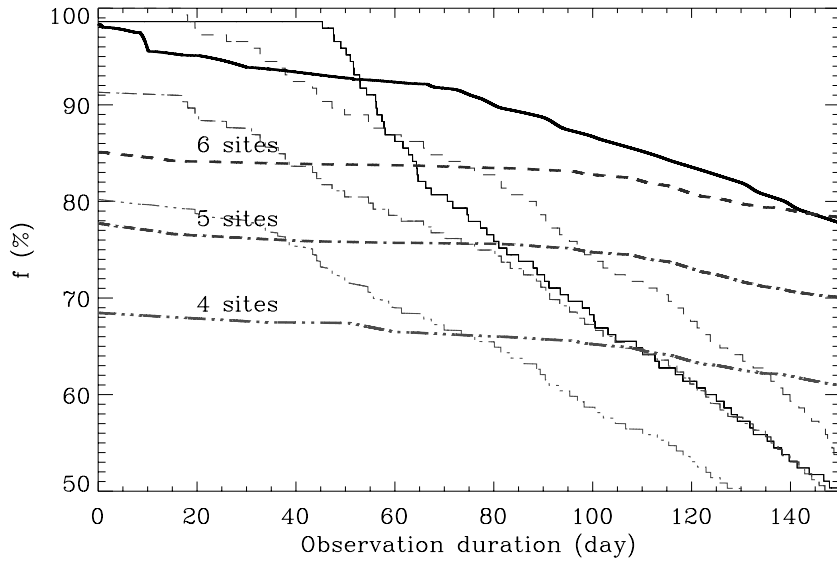


Figure 1: Comparison of the daily duty cycle distributions, at Dome C (full light line) or for a multi-site network (dashed light line: 6 sites; dot-dashed line: 5 sites; dot-dot-dashed line: 4 sites), and corresponding integrated duty cycle (heavy lines). Simulations for the network have been considered in the favourable case of an equatorial target, and for mean weather conditions.