Questions, Comments and Answers following the presentation

Stereo-SCIDAR on AT3

James Osborn

Kerber: Impressive results. AO without knowing what is going on in the atmosphere is daunting. How do you see future possibilities for AO operation support by SCIDAR?

The Stereo-SCIDAR can provide turbulence strength and velocity profiles in real-time. There are on-going studies to look at variations caused by different lines of sight.

All wide-field AO systems require a model of the atmospheric turbulence. This should be recovered from the AO telemetry itself but will take time to gather the statistical wavefront sensor data. If operational the Stereo-SCIDAR can provide a first guess of the turbulence profile in order to pre-build the reconstructor and enable observations to start as soon as the telescope is on target. This can be updated with measured profiles from the AO system as soon as it is available.

If the profile is used to make a synthetic reconstruction matrix, then the loop can be closed without having to centroid on NGS. This means that fainter NGS could be used as they will not be required in open-loop.

In addition, there are some complexities to recovering turbulence parameters from the AO telemetry. For example, a simultaneous fit of the vertical profile of the turbulence altitude, strength and outer scale is required. In order to do this we measure wavefront sensor data on-sky and assume all the variations from the turbulence is averaged out. However, if the dataset is not long enough in duration then we also have convergence noise. This convergence issue is difficult to model. Knowledge of the concurrent turbulence profile from an external profiler would enable us to fit only the outer scale and knowledge of the concurrent turbulence velocity could enable us to model the convergence problem.

This will not only improve the performance of the AO system but is also required for other applications such as PSF reconstruction.

Roth: Have you considered to commercialize your Stereo-SCIDAR system, e.g. for monitoring the environment of airports?

No, this has not been considered. We will look into it.

Masciadri:

1. *Which DIMM did you used for GS vs DIMM comparison?*
2. *comments: theta_0 shows samll values. Please pay attention to that to see how it evolves increasing the sample.*
3. *why not compare UT vs GS?*

1. The new DIMM was operation during our runs so this was used.
2. Ok.
3. This is difficult because the first SCIDAR bin is approximately 300m. The Surface Layer SLODAR is better suited for this application. Although we agree that a direct comparison might be interesting it is not obvious what the results would mean. We will have a look.

Girard:

1. *Comment: Works great it seems to correlate well with SPHERE SPARTA RTC (r_0, eq. wind speed).*
2. *Question: you still miss the first 250-300 m, the surface layer. Is there a plan?*
3. *Elena's predictions?*

1.
2. We do measure the integrated turbulence strength in the first ~300m. For a profile of this surface layer, the Surface Layer SLODAR is better suited and is operating robotically at Paranal.
3. This is certainly very interesting. When we have a sufficient data base we will begin comparisons with Elena.

Milli:Comment: Scidar would be very useful both for operators and astronomers analysing their data. Often with SPHERE in case of strong wind, the PSF is elongated and it can be hard to disentangle that from an extended object. Having the SCIDAR data would help.

I agree. There is evidence to suggest that the numerical models are very good at forecasting wind velocity. We do see complex structure in the velocity vectors of atmospheric turbulence, it will be interesting to see if the models can also forecast this.