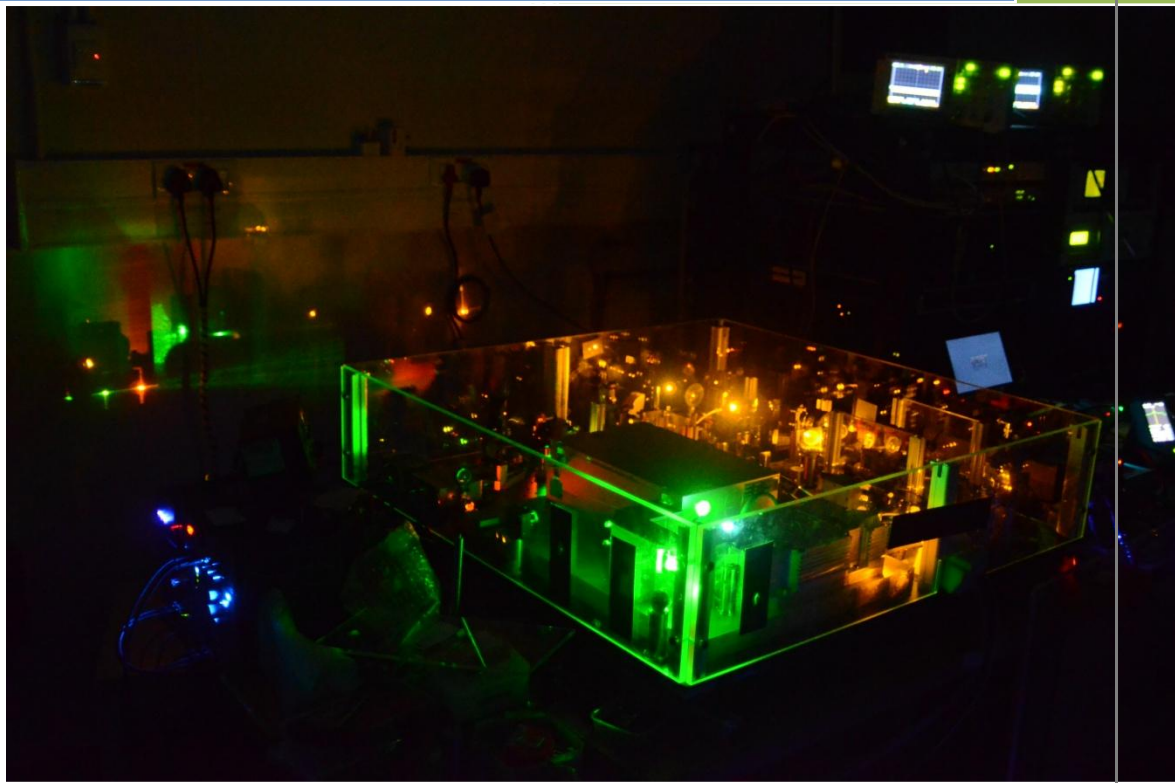




SALT NEWSLETTER

ISSUE MAY 2016



Southern African Large Telescope,
Sutherland, South Africa



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GOOD NEWS FROM SALT

Dear SALT Community -

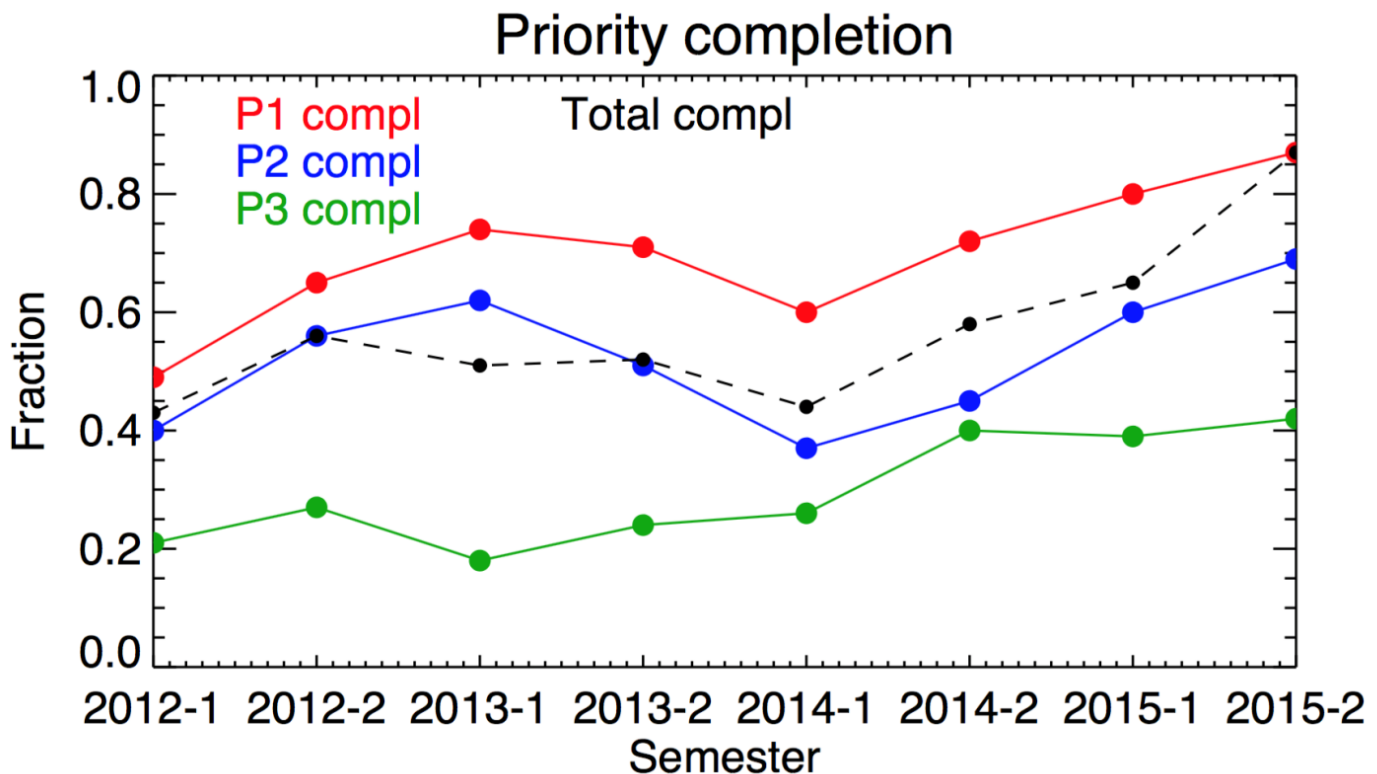
We, the whole team of SALT Operations, are very happy to report a number of exciting developments in this Newsletter. Read about the breakthrough in the active mirror alignment system, SAMS - at the time of writing we have just gone two nights without aligning the primary mirror while maintaining an excellent image quality all throughout! The Laser Frequency Comb is installed and in use with HRS for a few months benefiting those needing extremely high wavelength calibration accuracy. There are new SALT papers and press releases. And read about several SALT status updates regarding various observing modes, and new team members. The latest six month SALT observing semester finished at the end of April, and the main results of it are highlighted below.

The 2015-2 semester turned out to be the most successful one to-date as measured by a number of metrics. Most notably, the completeness fractions of *all* priority classes kept increasing, reaching nearly 90% for P1 blocks (see the Figure below). In fact, more than 95% of *submitted* P1 time was completed. The overall completeness of time allocated for the semester was also over 85%, the highest ever by a significant amount. As far as raw numbers are concerned, 1249 Blocks were completed during the semester, beating our previous record set only in 2015-1 by more than 250 blocks. The weather downtime was 38%, similar to other Summer semesters. Technical downtime and time used for engineering were both at 5%, having both continued to decrease - this fact combined with the very high efficiency of available science time converted to successful observations produced the gratifying record numbers.

We truly hope PIs are receiving satisfactory data that will lead to new refereed SALT publications, and we will try our best to increase the data quality even further with all the planned upgrades.

Meanwhile, we invite any PI with questions about their program, about their data quality, or advice on data reductions, to please not hesitate to contact us at salthelp@salt.ac.za.

Petri Vaisanen
Head of SALT Astronomy Operations



The historical fraction of completed time in the different Priority classes. The dip around 2013-2014 is due to more than budgeted commissioning time spent on HRS and RSS at that time period. Note that P3 time (green curve) has always been over-filled, i.e. there are more P3 blocks in the queue than actual allocated on-sky time available for it (over-filled queues make observations more flexible). In the past the over-filling factor was 1.5, but from 2015-2 onwards it is 3. Hence, the P3 completeness compared to available time was actually 125% in 2015-2. The black curve shows the *overall* completeness of allocated Science time, taking into account the over-filling above.

HEADS-UP ON 2016-2

We will be issuing a Phase-1 Call for Proposals for 2016-2 in late June, with a deadline Friday, 29 July.

SAMS: EDGE SENSORS & ACTIVE MIRROR ALIGNMENT

We are extremely happy to report progress on SAMS. The edge sensor project is now entering the final commissioning and testing phase of the project following the successful installation of the edge sensors to all 91 segments in the primary mirror array in April.

Already the first few closed loop tests have produced very encouraging results. On several successive observing nights in May, the edge sensors maintained the primary mirror alignment throughout the night, during normal science operations, after an initial alignment using the Shack-Hartmann alignment system. And the real breakthrough happened on May 15th, when, for the first time ever in the history of SALT, the telescope was operated over a night without a single alignment, SAMS having kept the primary mirror in check from the previous night.

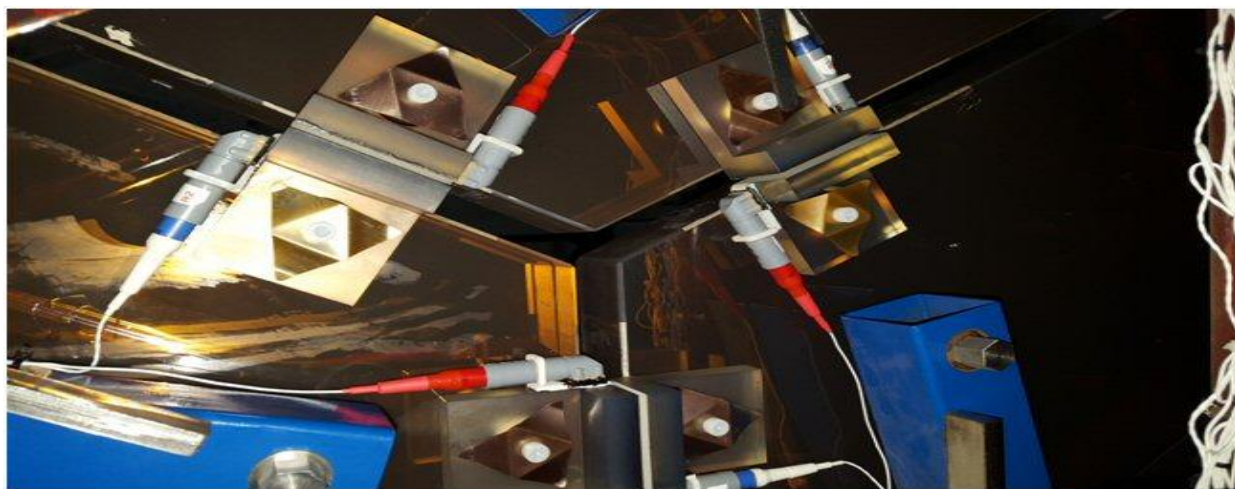


Fig: Edge sensors mounted to corner described by 3 adjacent segments

The system is required to keep the primary mirror aligned for a period of 5 days with a possible temperature span of 15 deg C. The approach towards the completion of this project is to use the system during normal astronomy operations and iteratively build towards demonstrating the system over the full duration and temperature span.

The system is immediately useful in that the mirror IQ remains stable throughout an observing night without periodic realignments using the Shack-Hartmann system as has been the case for several years. This saves time for science observations, and above all the *data quality* of all observations throughout the night is better without the severe PSF degradation with time that most PIs have seen in their data.

Needless to say, the SALT Astronomy Operations are very excited of these developments, and we are extremely grateful to Hitesh Gajjar, John Menzies, Chris Coetzee, and many others whose hard work over the years is now paying off for the benefit of the whole community.

POLARIMETRY

As reported earlier in the year, the RSS linear polarimetry mode for long-slit point sources is commissioned and in science use. A problem reported last time regarding unstable electronics at 0.3% level has been solved. We are in the process of deciding which polarimetric modes should be commissioned next. For this purpose, we make the following request:

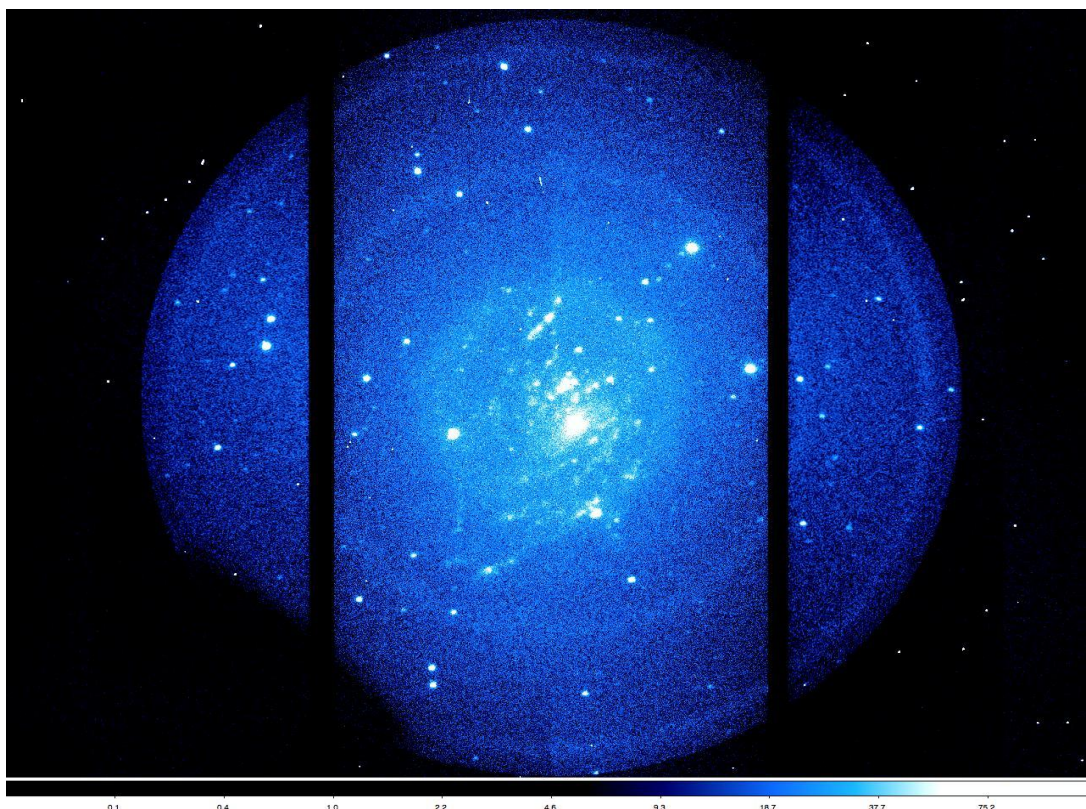


Anyone interested in performing RSS polarimetry over the next year, please let us know (a brief email to salthelp@salt.ac.za will do) before May 31st whether you are mostly interested in:

- a) Circular and/or All-Stokes polarimetry (long-slit, compact sources)
- b) Any long-slit polarimetric mode with extended targets.
- c) Any other mode, e.g. imaging, MOS, etc.

RSS FABRY-PEROT STATUS UPDATE

Fabry-Perot in its dual-etalon HR mode has been successfully commissioned and is ready for observations, albeit (currently) within a narrow temperature range. This is due to a temperature dependence on the material of the etalons' baseplates causing the two etalons to misalign with each other outside this temperature range, resulting in multiple reflection ghosts. New baseplates made up of invar will be installed during the RSS stand-down in August.



Meanwhile, LR operations are continuing as normal and dual-etalon mode HR observations are proceeding as weather and temperatures allow. A sample dual-etalon HR commissioning image (at central wavelength 6606) is shown above. Note that there are *no* multiple images due to etalon misalignment. The seeing was about 1", and the Moon was nearly full. In fact, due to the very narrow bandpass of the dual-etalon HR mode, full Moon appears to be tolerable at least for emission line objects. And the big plus of observing in bright Moon, of course, is that there is less competition in the bright time queue.

UPGRADES AND AUGUST TELESCOPE SHUTDOWN

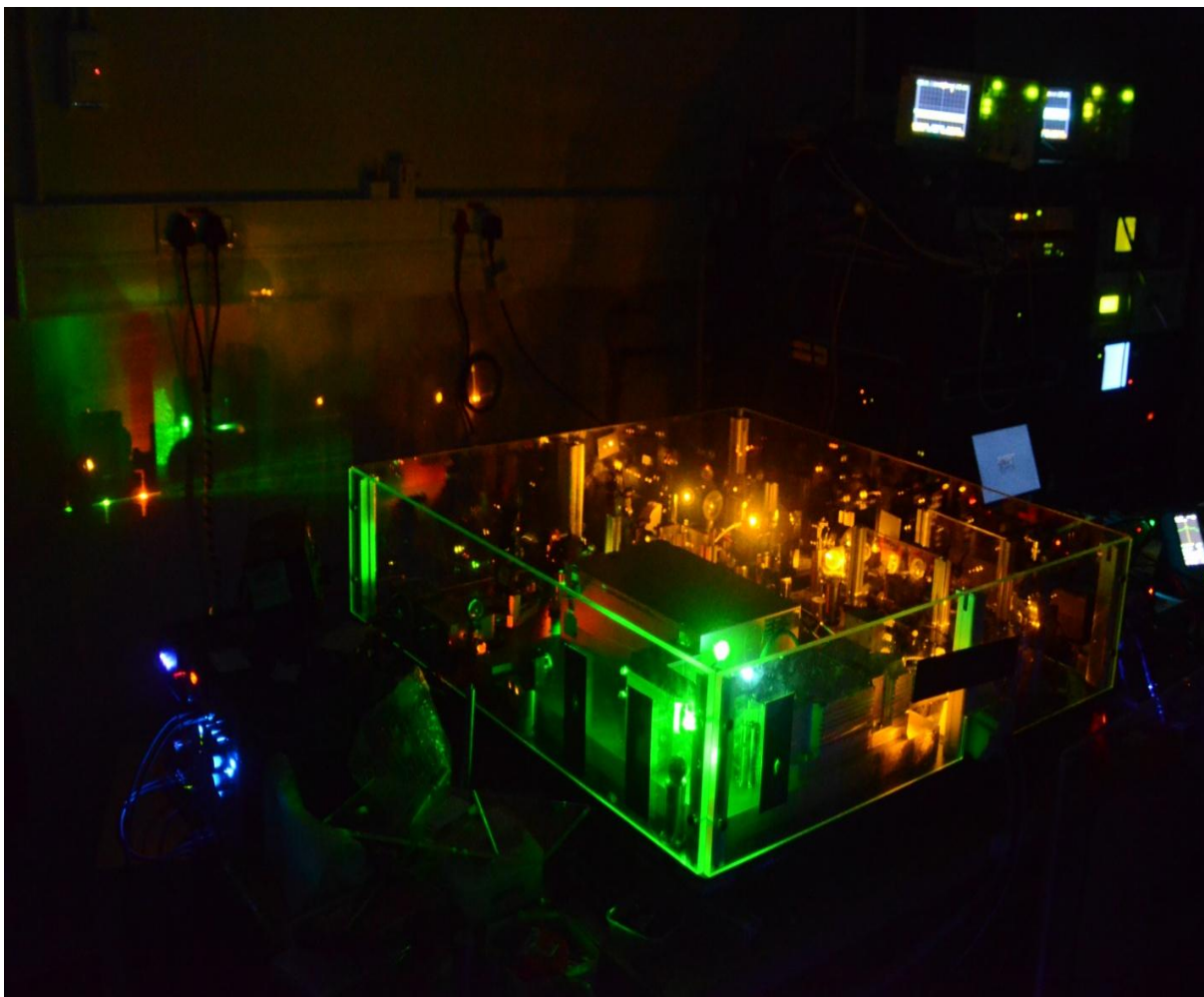
There will be a 4 week shutdown period at SALT in August. The time is needed to fully service the RSS optics. Last time this was done in late 2014, it resulted in a 40% improvement in the instrument throughput, and it has been determined necessary to repeat the operation every 18-24 months. We will take the opportunity to also attend to various other mechanical issues on RSS and the other instruments, and the telescope. The latter includes tracker upgrades and investigating the throughput and possible cleaning of the spherical aberration corrector - hence the total operational shutdown of the telescope for a month.

The downtime was taken into account already in the time allocations for 2016-1. PIs are encouraged, however, to check what it means for their individual programs and target visibilities. As always, Astro Ops is ready to allow PIs to exchange targets in their accepted Phase-2 programs in case targets go out of season during the shutdown and alternative ones are available later (or earlier).



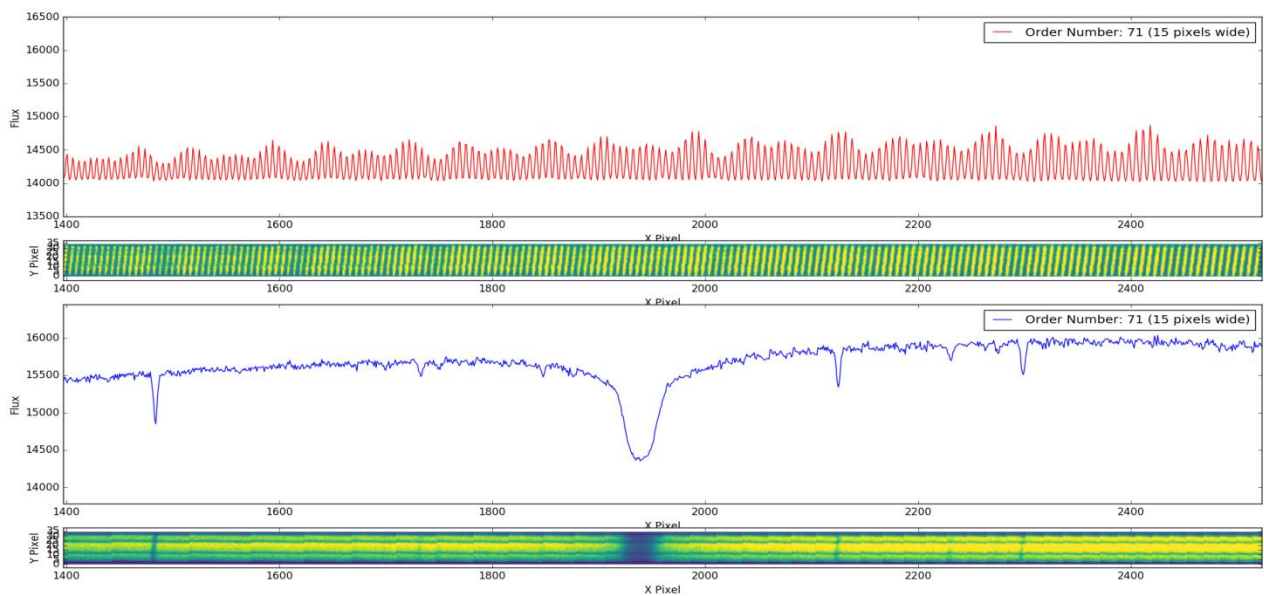
LASER FREQUENCY COMB UPDATE

HRS has seen a major (albeit temporary) upgrade over the past few months. A Laser Frequency Comb has been installed at SALT and is now in normal operations. It will stay at SALT until the end of July. The next figure shows how beautiful the comb is when in use in a dark room.



The installation and tests took place during the last two weeks of April, and after 5 long days of testing, we were able to obtain a simultaneous spectrum of a Spectrophotometric standard, LTT7379 and one of the comb.

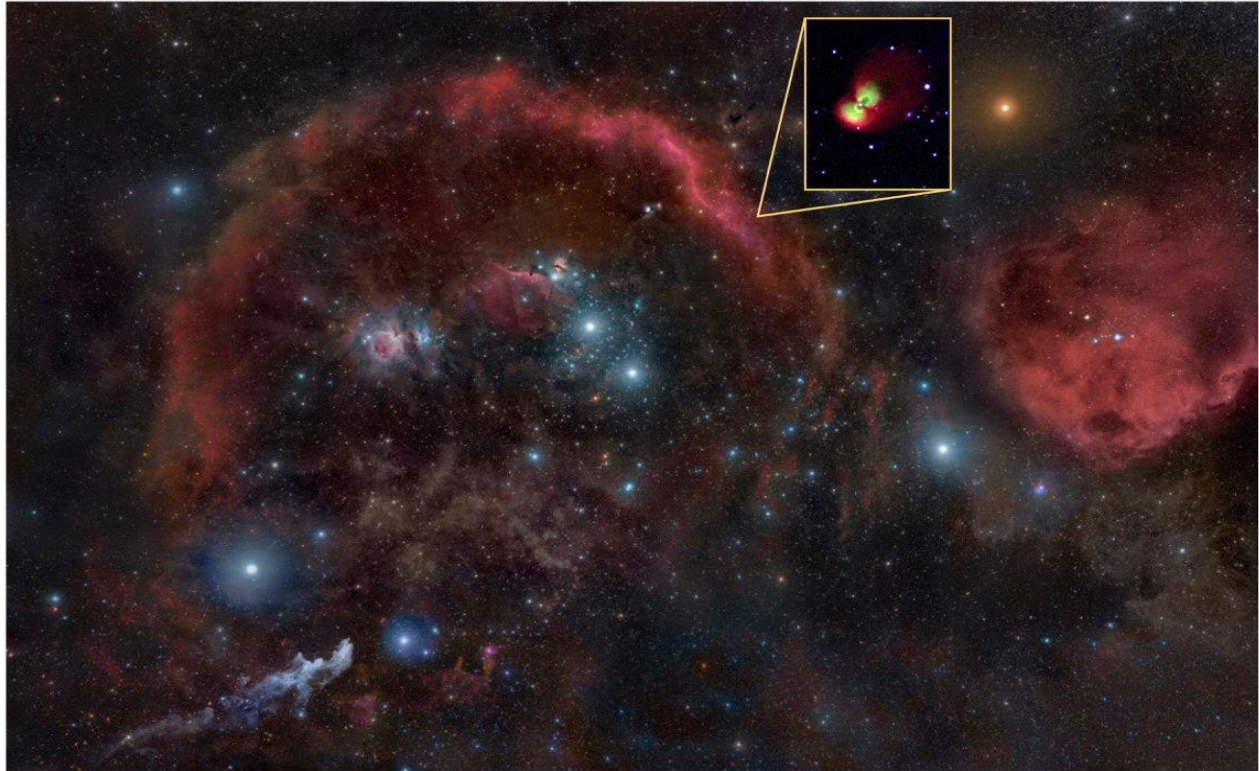
The next figure shows a zoom on the H α line (bottom part of the image) of LTT 7379, and the evenly spaced teeth of the comb (upper part). All the (almost) vertical lines in this upper panel have a wavelength extremely well known, and this explains why the accuracy of the data taken with a comb is so much better.



We could also take a spectrum of our usual calibration source, a ThAr Lamp and the comb. This will allow us to calibrate our source with a much better accuracy, and we will be able to benefit from the comb even after it's back to Edinburgh. As can be seen on the image below, a comb is much better compared to a ThAr lamp, & this explains why LFC are planned to replace ThAr lamps in all the major large telescopes to be built.



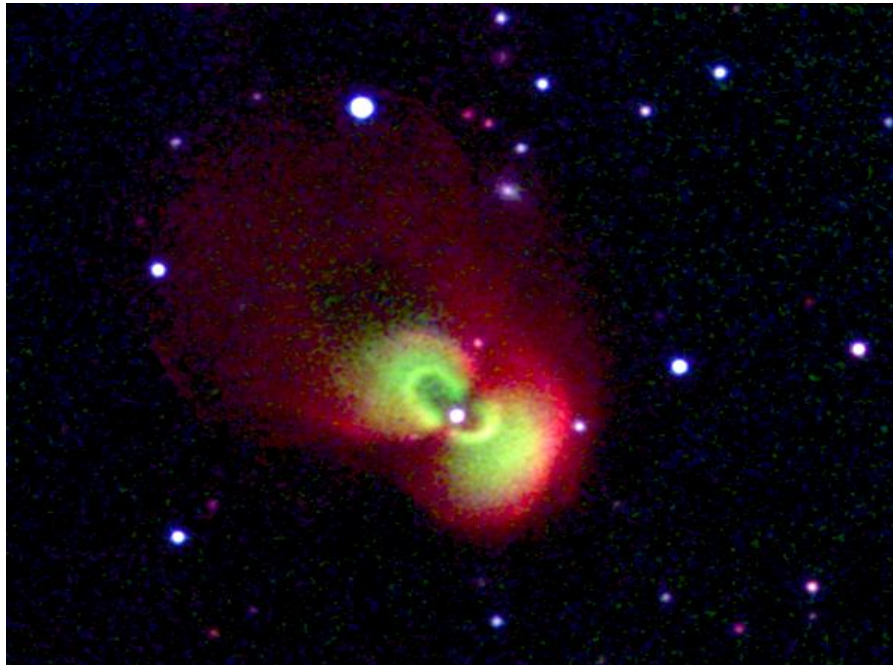
ECHOS OF AN ANCIENT EXPLODING STAR



When amateur astronomers found a peculiar looking nebula called Te 11 in the Orion constellation in 2010, astronomers weren't quite sure what to make of it. It could have been the envelope of an old star like the [Sun](#) or the result of a violent stellar explosion. Combined observations taken primarily by telescopes of the SAAO in Sutherland, South Africa, have shed new light on the conundrum. According to a recently published paper by a team of astronomers based in South Africa, England, Chile, Spain and Mexico, led by Dr Brent Miszalski (SAAO/SALT), the nebula seems to have been formed in a stellar explosion just over 1500 years ago according to ancient Chinese records. The study utilised high-speed observations from the Sutherland High-speed Optical Camera (SHOC) on the SAAO 1.9-m telescope to classify the unusual star at the centre of the Te 11 nebula as a dwarf nova and to determine its characteristics. This is a particularly rare combination of star and nebula, with only two other examples known.

Discoveries such as these are uniquely placed to tell us how the long term evolution of similar stars takes place over thousands of years. The distance to the object was also determined with the help of SALT spectroscopy, allowing the authors to estimate that at the time of the explosion, the star may have rivalled Jupiter in brightness, outshining all the other stars in the Orion constellation.

Read more at: <http://www.sao.ac.za/press-release/astromers-pinpoint-echoes-of-ancient-exploding-star-on-our-stellar-doorstep/>



MEET THE TEAM: CHRISTIAN HETTLAGE

After studying at the University of Göttingen in Germany, Christian came to Cape Town in 2006 for three months in order to help with the PIPT. Three months turned into six, a year, and he somehow still hasn't left, (editor: which is excellent news for SALT!) That gives him the opportunity to work on the PIPT, dabble with the Web Manager, help with Open Nights, and reply to emails sent to salthelp.



When he's not busy with his work, he enjoys reading books and going for a run. He thinks that his age of 42 would be a good reason to try a marathon, but still needs some persuasion in this regard. One of his flaws is that after so many years he hasn't managed to master the click sounds in the South African language isiXhosa.





NEW SALT ASTRONOMERS

Starting from the 1st June, the SALT astronomy team will welcome three new members: Drs. Marissa Kotze, Rudi Kuhn, and Rosalind Skelton. We look forward to introducing them to you over the next few SALT Newsletters.

SCIENCE PAPERS

Published SALT papers after the previous SALT update sent in late January are listed below. Interestingly, 3 of the 7 papers here use Salticam and HRS data, while more than 90% of SALT papers over the past 2 years have been RSS ones.

We strongly encourage SALT users to inform us of any papers making use of SALT data, and to double check the list here after publication:

<http://astronomers.salt.ac.za/data/publications/>

Please adhere to the Acknowledgements policy found under the link above. The SALT Board has also requested that authors using SALT data make an effort to mention SALT in the title, if appropriate, or in the abstract.

- ❖ Kniazev, Gvaramadze and Berdnikov report on a new luminous blue variable star revealed by SALT and Spitzer observations. The paper is the second time HRS data is used in a refereed publication.

<http://adsabs.harvard.edu/abs/2016MNRAS.459.3068K>

- ❖ Marion et al. find evidence for interaction between a normal Type Ia SN and a non-degenerate binary companion using spectra including data from RSS/SALT. <http://adsabs.harvard.edu/abs/2016ApJ...820...92M>

- ❖ Norton et al. confirm a SuperWASP discovery using RSS/SALT of a semi-detached eclipsing binary that contains a δ Scuti star.

<http://adsabs.harvard.edu/abs/2016A%26A...587A..54N>

- ❖ Pagnotta and Zurek searched for nova shells using Salticam imaging around accreting white dwarfs, asynchronous polars specifically.

<http://adsabs.harvard.edu/abs/2016MNRAS.458.1833P>

- ❖ Parrent et al. perform a comparative analysis of SN 2012dn optical spectra, including data from RSS/SALT.

<http://adsabs.harvard.edu/abs/2016MNRAS.457.3702P>

- ❖ Raman et al. have used Salticam to investigate the optical reprocessing of X-rays in the low-mass X-ray binary pulsar 4U 1626-67

<http://adsabs.harvard.edu/abs/2016MNRAS.458.1302R>

- ❖ van Soelen et al. present RSS spectroscopic monitoring results of a gamma-ray binary system as it went through periastron and find evidence of disruption of the circumstellar disc.

<http://adsabs.harvard.edu/abs/2016MNRAS.455.3674V>



Photo by Dr Alexei Kniazev, Sutherland