



First Science With SALT

First Science Press Release: 16 Aug 2006

SAAO, Cape Town

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&

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First Science With SALT

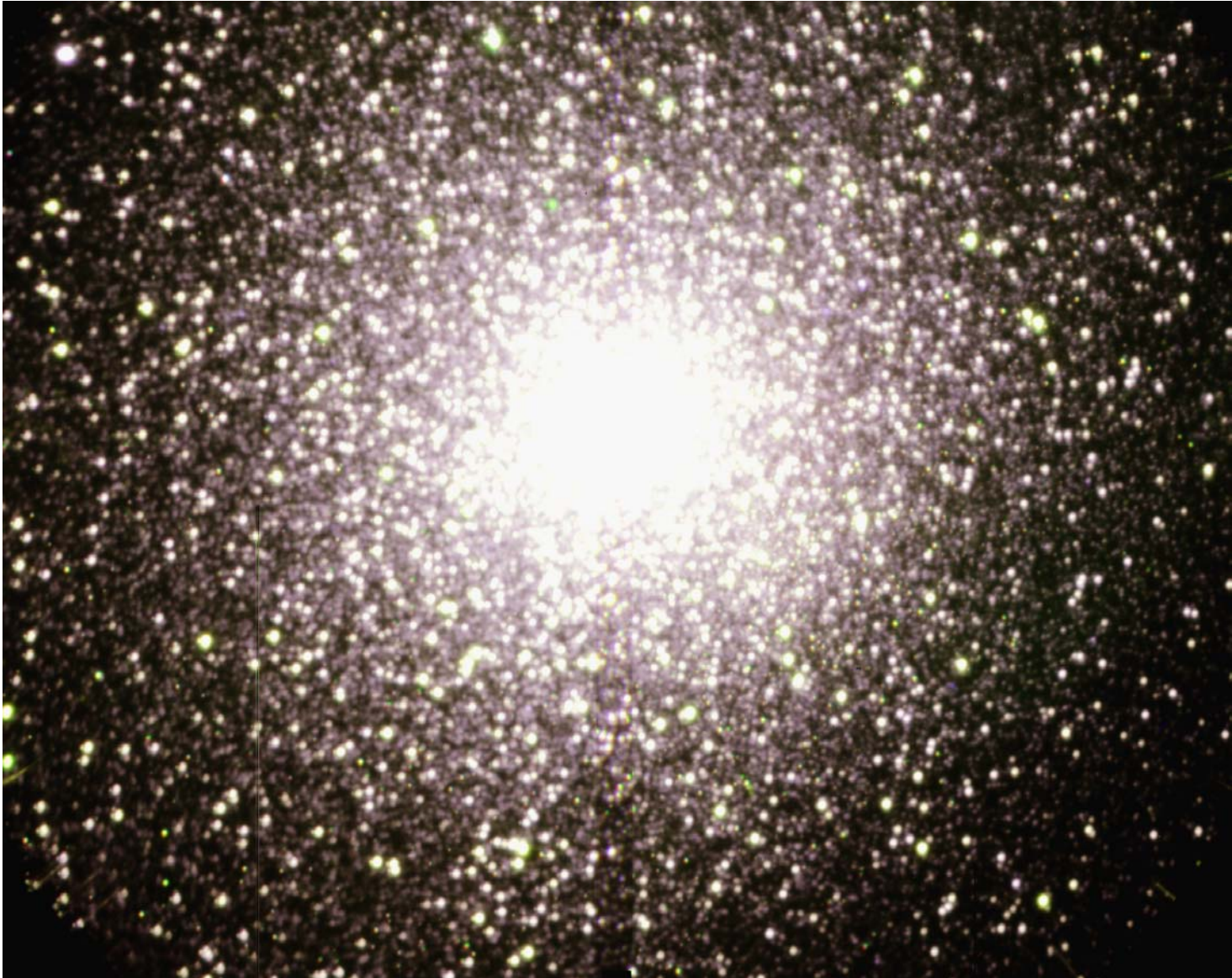
[http://www.salt.ac.za/
public-info/milestones/
first-science-with-salt/
media-invitation](http://www.salt.ac.za/public-info/milestones/first-science-with-salt/media-invitation)



First Science With SALT

Recent SALT Milestones:

2005 Sep: First Light





First Science With SALT

2005 Nov: SALT Inauguration

By President Mbeki



Southern African Large Telescope (SALT)
Inaugurated by the President
of the Republic of South Africa,
Mr TM Mbeki
on 16 November 2005



First Science With SALT

Today it's First Science With SALT:

High speed imaging and brightness measurements of gas accreting on to a white dwarf star with a magnetic field of ~30 million gauss

(about a thousand times stronger than the magnetic field in an MRI scanner)



First Science With SALT

What is the significance of the science?

- **The first serious science done with SALT**
- **Demonstrates a capability other large telescopes don't have: ability to take high speed images with ultrasensitive CCD detectors**
- **Best observations of this kind made so far: the data are a “text book” demonstration of our understanding of these stars**
- **It's exciting – astronomers who have seen these data have sighed “Awesome” (or the nearest astronomers get to “Awesome”).⁷**

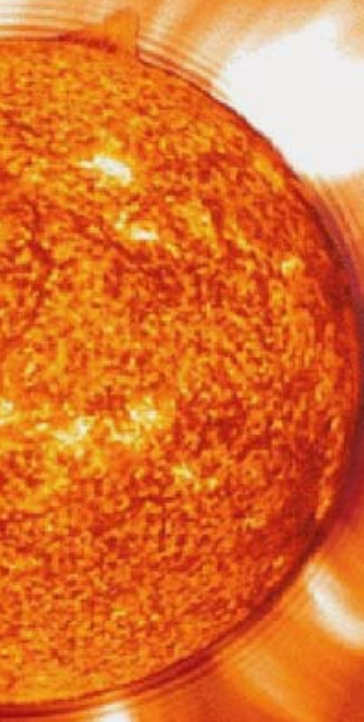
Why is the science interesting to astronomers?

Accreting gas in magnetic fields is seen in various places in the Universe:

- In Black holes in centres of galaxies**
- In Neutron stars (pulsars)**
- Planets in our Solar System such as Jupiter**
- Our own Earth and Sun**

Polars are a handy “laboratory” for studying this phenomenon

Sun

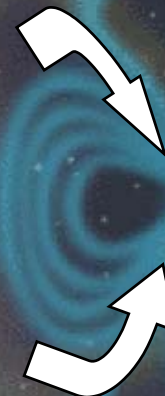


Solar
Wind

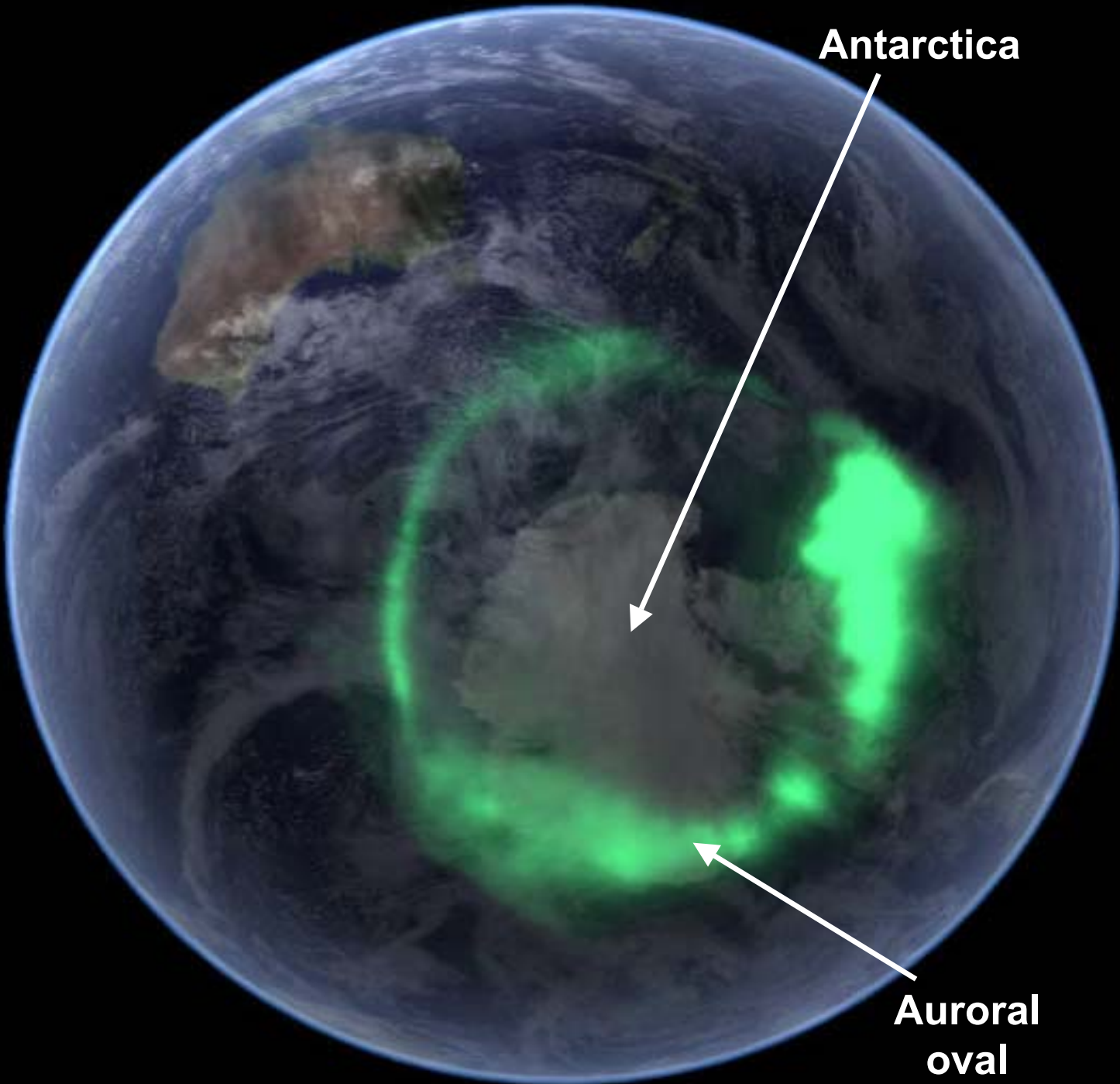


Earth

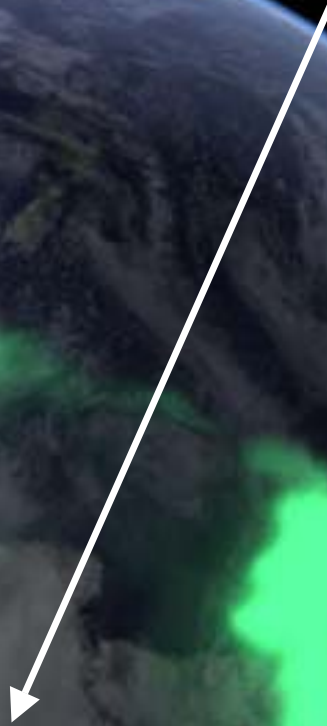
Earth's
Magnetic
Field



Solar wind can
only accrete
at the Earth's
magnetic poles
(two arrows)



Antarctica



Auroral
oval

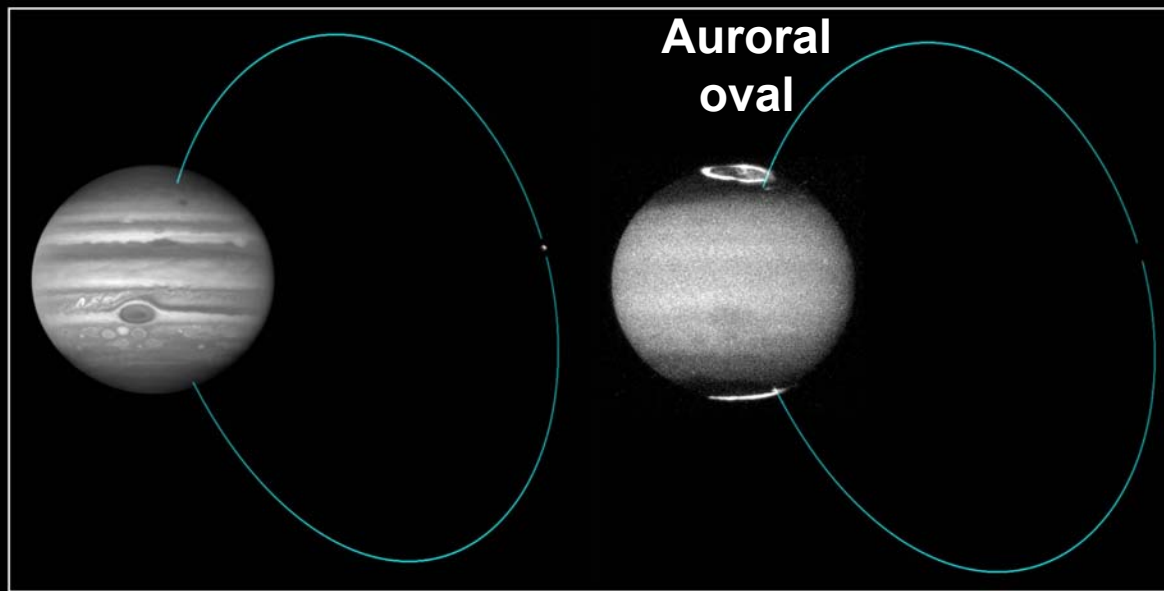


**View From
An Antarctic
Research Station**

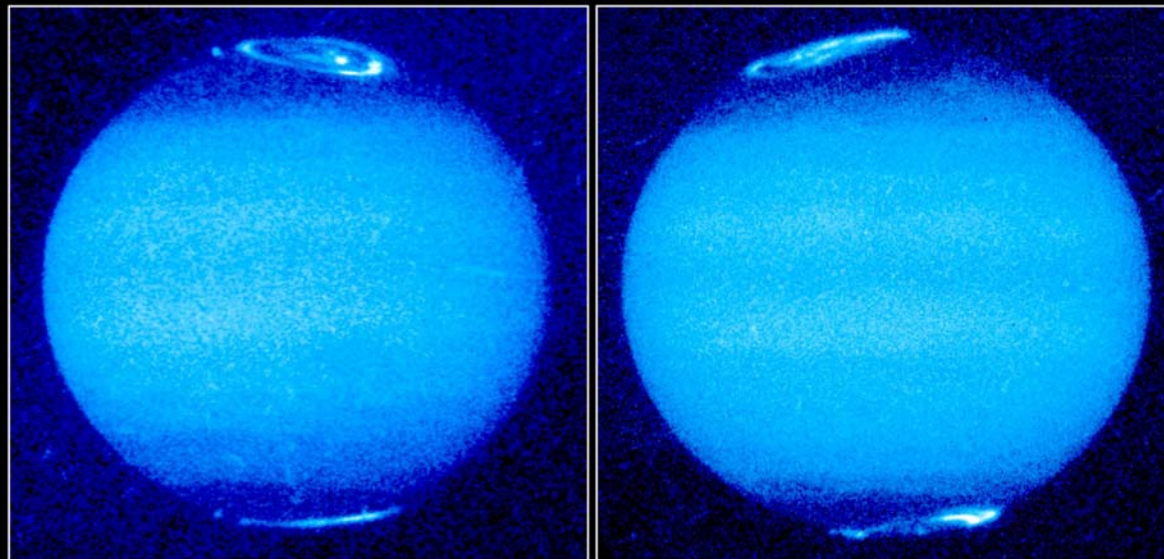


**View From The
Space Shuttle
(300 km above the
Earth's surface)**

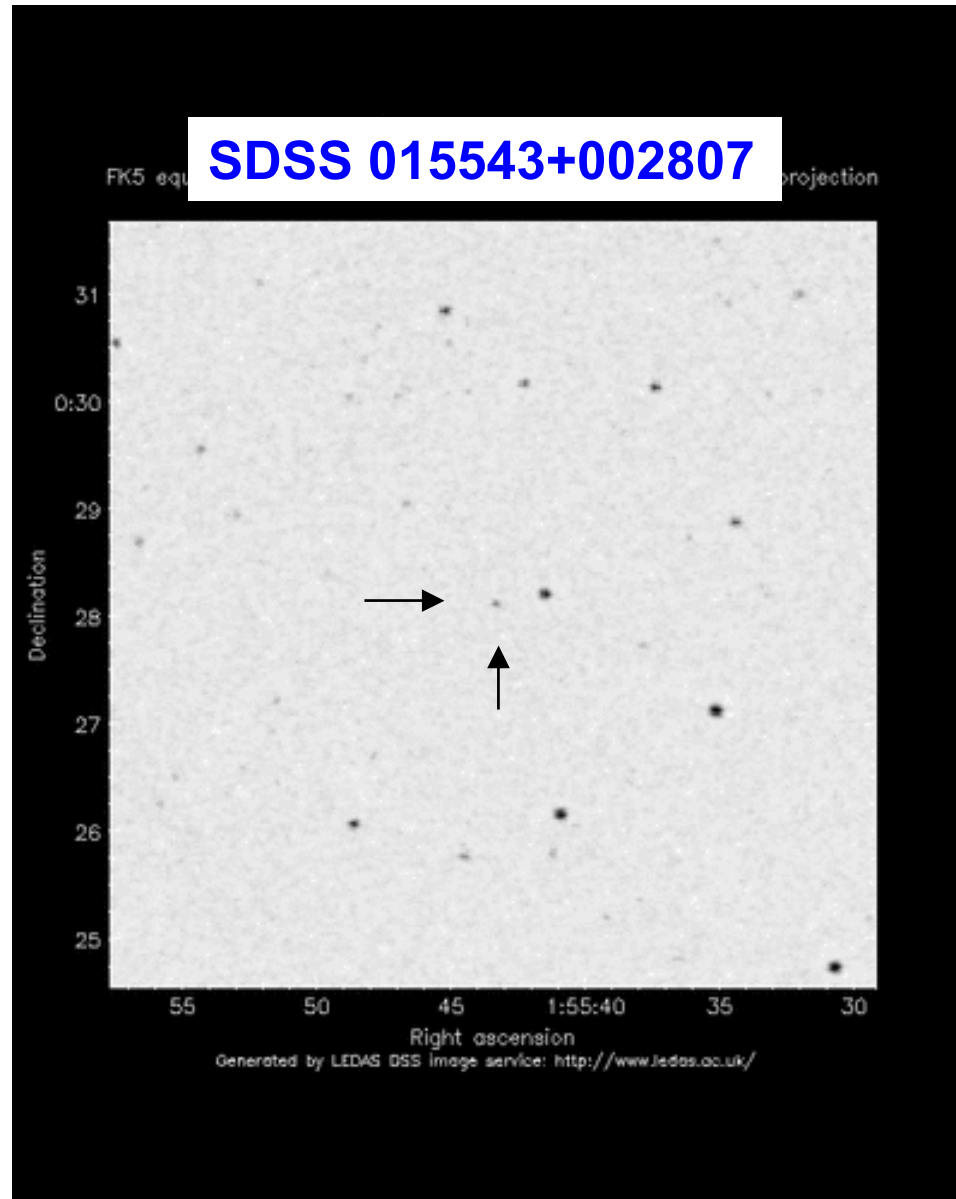




**Aurorae on
Jupiter (from
the Hubble
Space
Telescope)**



Jupiter Aurora
Hubble Space Telescope • WFPC2





The typical layout of a “Polar”: 2 stars VERY close to each other (~ earth-moon distance). One is a normal star, shown in orange/red. The other (blue/white) is a tiny “white dwarf” star (the size of the Earth roughly). The white dwarf is gravitationally pulling off the outer layers of its friend, and channeling the gas on to its magnetic poles

SALT

Companion
Star

Mass
Transfer
Stream

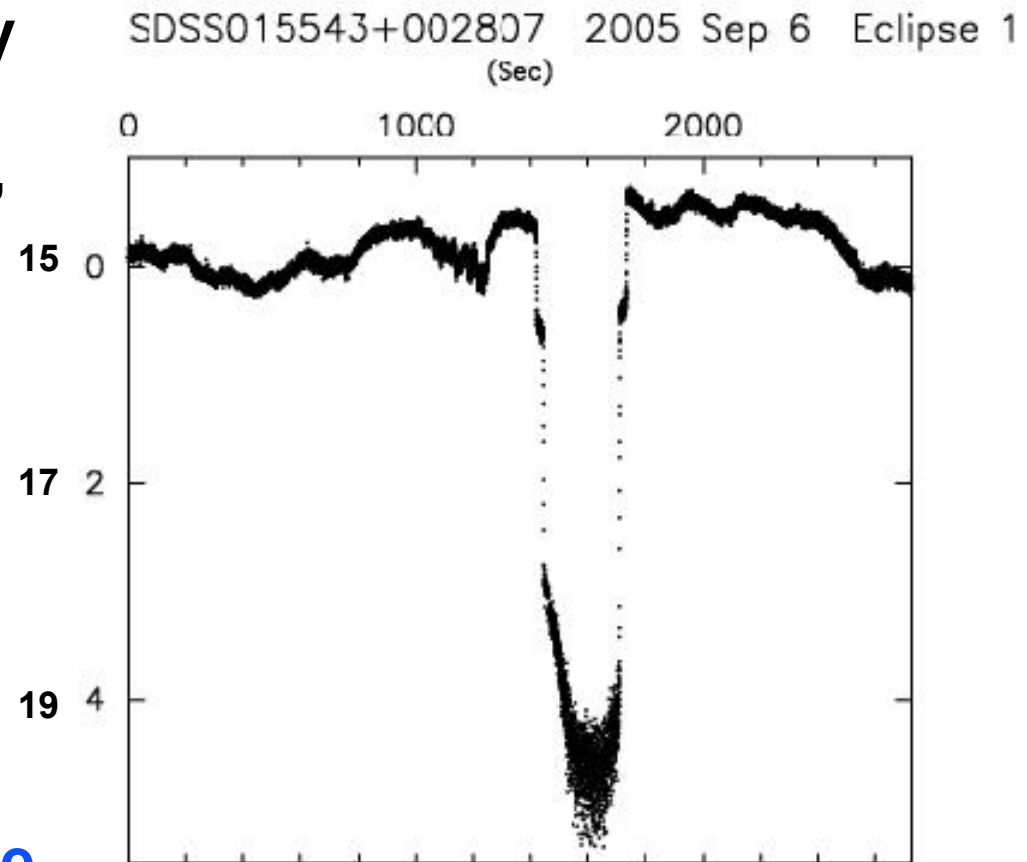
Magnetic
White
Dwarf
star
accretes
at its poles

Artist's painting
but the best (most
scientifically faithful)
idea of what a polar
looks like from
behind the white
dwarf, looking
towards the normal
star.

SALT images taken every 112 millisecc, turned into a measure of brightness, gave this graph of brightness vs. time.

The variable brightness is due to fluctuations in brightness of the gas stream

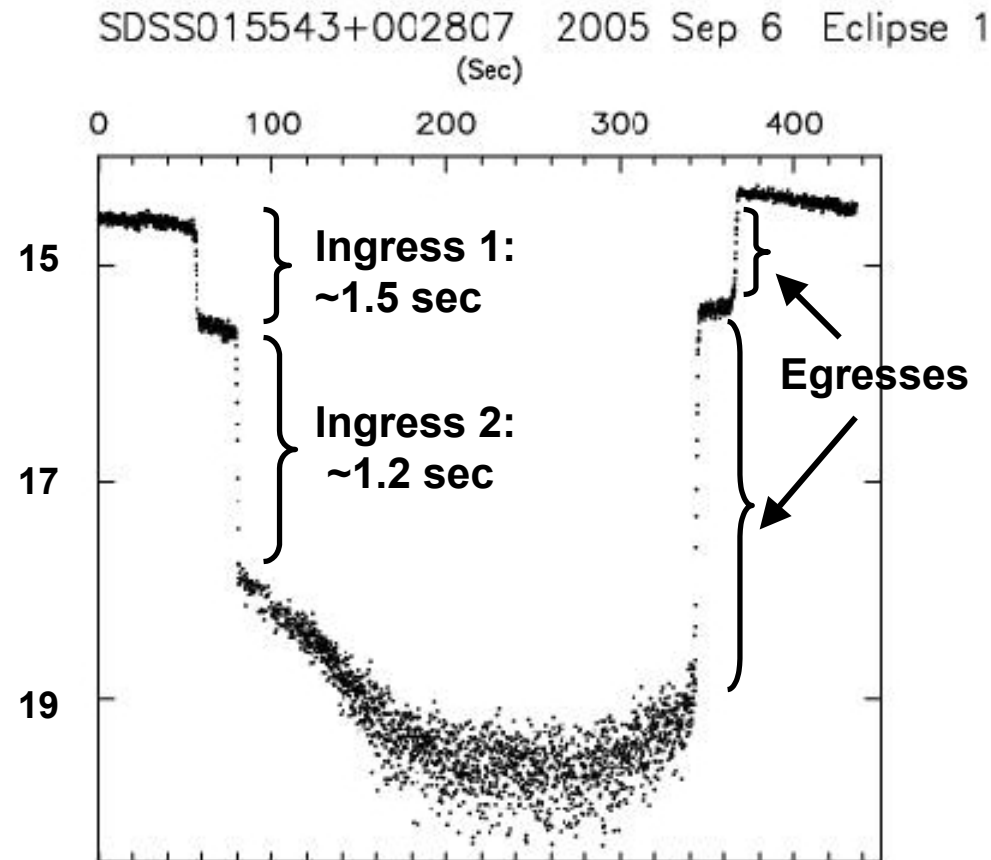
The deep dip is due to eclipse every 87 min of the white dwarf by the companion star



Eclipse details: each point is a 112 millisecc exposure.

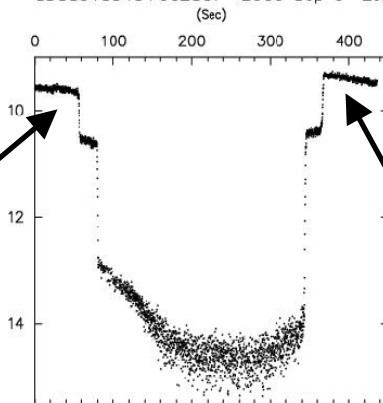
95% of the light from the whole system is emitted by 2 spots each of which disappear in about 1 sec.

About 5 per cent of the light comes from the gas stream; the light from both stars is swamped by the light from the spots and the stream!



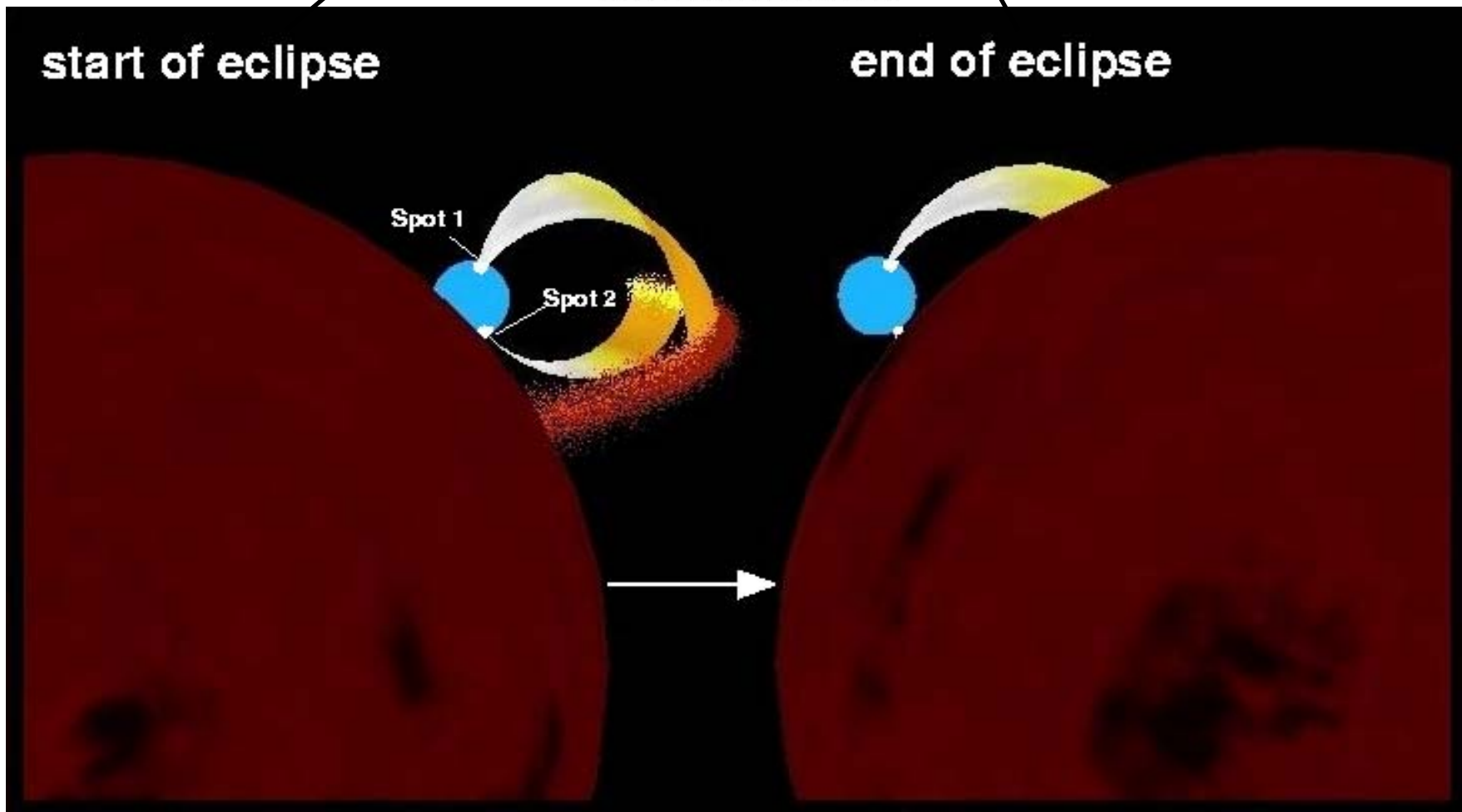
Schematic Of What We Are Seeing

SDSS015543+002807 2005 Sep 6 Eclipse 1

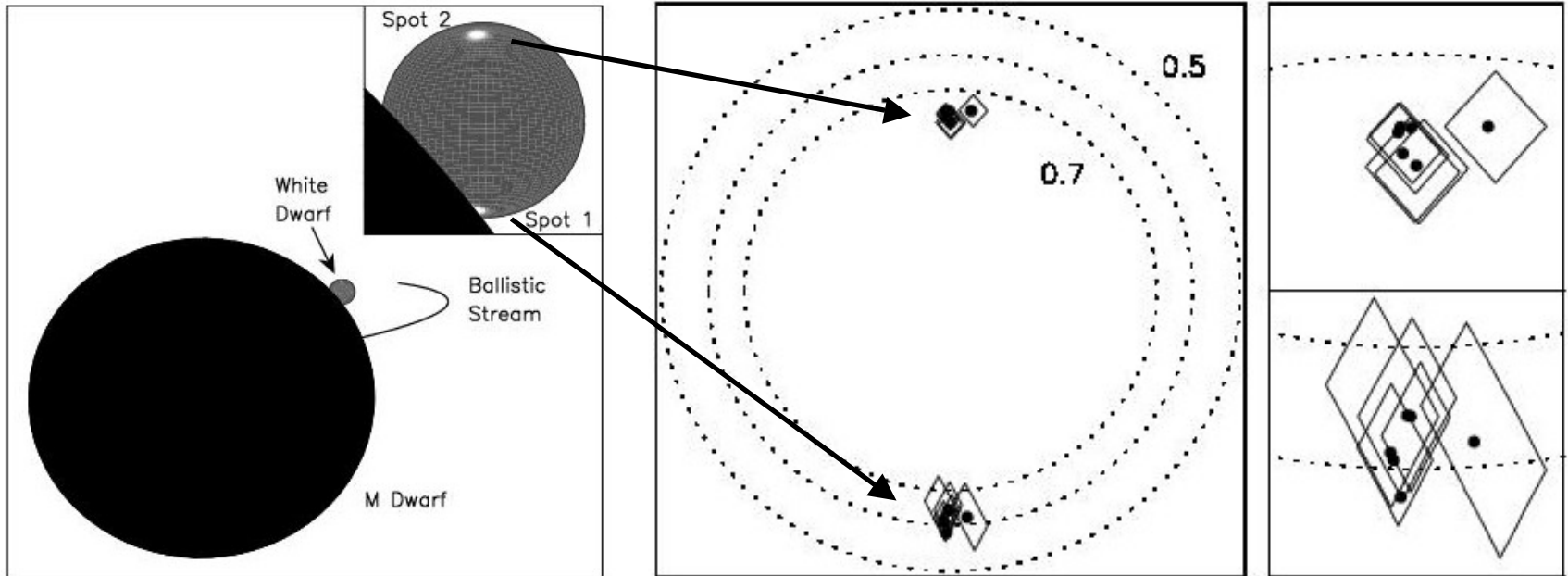


start of eclipse

end of eclipse



Accretion spots about the size of 1-3 x Western Cape



Multiple eclipses over a couple of months have allowed us to determine the size and stability of the accretion spots.



First Science With SALT

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First science with SALT: peering at the accreting polar caps of the eclipsing polar SDSS J015543.40+002807.2

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ABSTRACT

We describe briefly the properties of the recently completed Southern African Large Telescope (SALT), along with its first light imager SALTICAM. Using this instrument, we present 4.3 hr of high speed unfiltered photometric observations of the eclipsing polar SDSS J015543.40+002807.2 with time resolution as short as 112 ms, the highest quality observations of this kind of any polar to date. The system was observed during its high luminosity state. Two accreting poles are clearly seen in the eclipse light curve. The binary system parameters have been constrained: the white dwarf mass is at the low end of the range expected for cataclysmic variables. Correlations between the positions of the accretion regions on or near the surface of the white dwarf and the binary system parameters were established. The sizes of the accretion regions and their relative movement from eclipse to eclipse were estimated: they are typically 4°–7° depending on the mass of the white dwarf. The potential of these observations will only fully be realised when low state data of the same kind are obtained and the contact phases of the eclipse of the white dwarf are measured.

Key words: accretion – binaries close – novae, cataclysmic variables – X-rays: stars.

1 INTRODUCTION TO SALT

The Southern African Large Telescope, colloquially known by its acronym SALT, has recently been completed. It is now in the final stages of commissioning and first stages of science operations. This paper describes the properties of the telescope and its imaging camera SALTICAM. It then presents the first science observations of an eclipsing magnetic cata-

clysmic variable, SDSS J015543.40+002807.2, analyses the data and shows how our knowledge of this star has been advanced.

Although SALT has been described in the proceedings of SPIE conferences (e.g. Stobie et al. 2000; Meiring et al. 2003; Meiring & Buckley 2004), these publications are not available in all astronomical libraries and not accessible on the Internet. Thus, a brief description of SALT is appro-

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Steps in scientific publishing:

- Write the paper and submit it to the journal
- The journal sends it to another “expert” in the field to review it
- That person sends in a review which recommends to reject OR to publish OR to fix and publish
- A revised version is produced if the review is “fix and publish”
- The paper is “in press” but “preprints” posted on the web
- Eventually appears after ~1 yr!

The paper has been accepted by Monthly Notices of the Royal Astronomical Society, one of the top astronomy journals. It's now “in press” and will appear by the end of the year. ²¹

See: <http://www.astronomy2006.com>



The screenshot shows the website for the IAU XXVIth General Assembly in Prague 2006. The header features a collage of historical astronomical figures and the Prague skyline at night. A navigation menu on the left lists various sections such as 'Welcome Message', 'Registration', and 'Accommodation'. The main content area includes a 'Welcome Message' section with a paragraph about the assembly's return to Prague, a 'Daily GA Newspaper' section with a Latin title 'DISSERTATIO CVM NVNCIO SIDEREO III', and a 'Streaming video' section. A 'Headlines' section on the right lists recent news items. At the bottom, there is a 'Public IP Address Pools' section with a warning about proxy servers.

There are typically 10000 – 20000 astronomers on the earth (depends on how you define “astronomer”). Most of them are members of the International Astronomical Union (IAU) and this body has a large get-together every 3 years. This is one of those years and the conference begins today in Prague. 2500 astronomers have registered to attend.

"Dissertatio cum Nuncio Sidereo III" is the official newspaper of the IAU General Assembly 2006

D I S S E R T A T I O C V M
N V N C I O S I D E R E O I I I
P R A G A E M M V I S E R I E S T E R T I A

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You can send short contributions (up to 400 words, i.e. 2000 letters; preferably in TXT, RTF or DOC formats) directly to our editorial e-mail: nuncius@ig.cas.cz.

If you have longer article for submission or any specific question then it is necessary to contact (by e-mail) any of the editors from the list below.

Phone line to Editor's office during GA: 239 077 072 !!! Cell phone: 608 549 939

We hope that this newspaper will prolong the magnificent tradition of Prague's "Conversations with (Galileo's) Sidereal Messenger".

Each day, there is a newspaper produced at the General Assembly. The press release being distributed today is being published in today's edition of Nuncio Sidereo



Questions?

Then we move on to Dave to tell us about whether Pluto is a planet or not, and why (as well as why should anyone care!)

