The Southern Skies Digital Science Partnership

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NASA Spitzer Space Telescope

OVERVIEW

Mt Kent Observatory is now providing live remote observations of southern skies as part of a collaborative project between USQ, the University of Louisville, and Northern Kentucky University. Telescopes at Mt Kent and Moore Observatory in Kentucky enable students to remotely observe otherwise inaccessible night-time skies using a 0.5m aperture telescope located in the opposite hemisphere. Mt Kent Observatory delivers live remote observing using multiple CCD cameras for narrow and wide-field imaging, and an astronomer at the observatory supervising remote use via a videoconferencing system. This project demonstrates the feasibility of live remote observing for astronomy education.

Some Southern Skies program images (clockwise from lower left):
- *Jupiter's Galilean moons*
- *Jupiter in the ultraviolet*
- *Omega Centauri (moonlit 10s exposure)*
- *Proxima Cen (M5.5V)*

SOUTHERN SKIES PROGRAM

The **Digital Science Partnership** is an initiative of the University of Louisville and Northern Kentucky University, funded by NASA to deliver live remote observing for astronomical education, research and outreach. The **Southern Skies** program is the extension of this Partnership to the southern hemisphere, through a collaboration between the University of Louisville and the University of Southern Queensland. For this program two essentially identical facilities have been created, one at Mt Kent Observatory in Queensland (151.855278^0 E, 27.797778^0 S, 682m altitude), the other at Moore Observatory in Kentucky (85.5288^0 W, 38.3444^0 N, 230m altitude). This enables observers to make daytime use of a remote telescope during its local night-time, and image otherwise inaccessible skies.

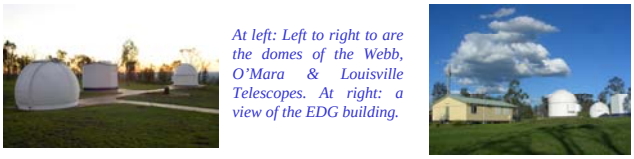
Mt Kent Observatory at night & Moore Observatory during the day

MT KENT OBSERVATORY

The University of Southern Queensland operates Mt Kent Observatory at a dark-sky site about 30 minutes' drive south-west of the University's Toowoomba campus. The site has an "Educational Development Group" utility building and 3 telescopes in separate domes:

1. **Webb Telescope**: 40cm Meade LX200 used visually for student field nights
2. **O'Mara Telescope**: Paramount robotic mount, 30cm Meade optics, SBIG STL1301 camera
3. **Louisville Telescope**: A 0.5m aperture astrograph used for the Southern Skies program

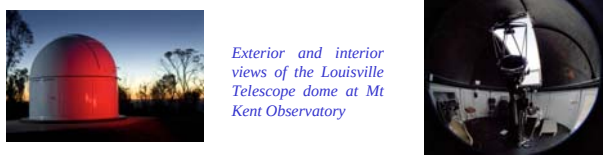
A Davis Vantage Pro Weather Station monitors site rainfall, wind, temperature and humidity, and a Boltwood Cloud Sensor is installed. Electronic site security includes a remotely operable security camera used for monitoring the site. The EDG utility building has accommodation facilities, a computer server room and control room. A line-of-site 34 megabit/s E3 microwave link connects the Observatory to the campus and its 1 gigabit/s fibre-optic link to the Internet.



At left: Left to right to are the domes of the Webb, O'Mara & Louisville Telescopes. At right: a view of the EDG building.

PLANEWAVE CDK20 TELESCOPE

The Southern Skies program at Mt Kent Observatory uses a **Planewave Instruments** CDK20 (Corrected Dall-Kirkham) 0.5m aperture f/6.8 astrograph optics on a **Celestron** mount. This cost-effective optical design provides a wide flat field for imaging with large format CCDs. An **SBIG** model STL6303 camera is installed at the telescope focal plane, delivering a 18.34'×27.51' field of view with 0.537" (9 micron) square pixels. A UBVRI filter wheel is installed for photometry and general imaging, but is interchangeable with an LRBGC filter set if photorealistic colour imaging is required. An **SBIG** STV astronomical television camera with eFinder optics (2.7^0×2.0^0, 18" pixels) is used for target acquisition, and a **Nikon** DSLR (15.8^0× 10.6^0, 15" pixels, f = 85mm lens) is being tested as a wide-field one-shot colour piggyback camera. The telescope is housed in a **Sirius Observatories** 3.5m diameter fibreglass dome equipped with a dome control system developed especially for the Southern Skies program. On a fixed wall inside the dome, a remotely operable security camera with low-light capability is installed to allow remote observation of telescope and dome motion.



Exterior and interior views of the Louisville Telescope dome at Mt Kent Observatory

LIVE REMOTE OBSERVING

The remote observing system is based on software that runs under Linux:

- **XmTel**: telescope control via Celestron NexStar protocol (also works with Meade & RCOS)
- **XEphem**: used with XmTel to provide telescope control via an interactive star chart
- **XmCCD**: controls the SBIG STL6303 camera

In addition, STVREMOTE software enables browser-based remote control of the STV acquisition camera, and a POLYCOM videoconferencing system links Mt Kent Observatory with the University of Louisville's Gheens Science Hall and Rauch Planetarium.

Live remote observing sessions have begun. School students at the Planetarium in Kentucky make the observations under the supervision of staff at the Planetarium and at Mt Kent. The remote observing experience for students is enhanced by their ability to converse with an astronomer at Mt Kent, who is also able to attend to any minor technical on-site problems, and maintain interest during a session affected by poor weather.

The advent of live remote sessions using Mt Kent Observatory demonstrates the feasibility of using remote observing as a tool for innovations in astronomical education.

FURTHER INFORMATION

Southern Skies Digital Science Partnership
http://mtkent3.it-servers.louisville.edu/southern_skies/index.html

University of Louisville and University of Southern Queensland Observatories
http://mtkent1.mko.usq.edu.au/

Mt Kent Observatory
http://orion.mko.usq.edu.au/

Remote Access to Mt. Kent Observatory in Queensland Australia
http://mtkent3.it-servers.louisville.edu/mtkent/remote/

Acknowledgements: *We wish to thank our support staff at USQ and the UoL, and acknowledge the financial support provided by our Universities and NASA.*

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