Remote observing with the ING telescopes

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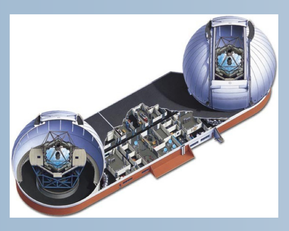
Introduction

The advent of high-bandwidth, low-latency networks allows the possibility of observing remotely from the telescope, either at an observatory's 'sea-level' base, or indeed from farther afield. Several major observatories offer remote observing routinely; for example, UKIRT and CFHT observations are carried out by staff at their respective sea-level bases in Hilo and Waimea.

Observations with the Keck telescopes are similarly carried out from their base in Waimea, but in addition astronomers can elect to observe from dedicated remote sites in continental U.S. Roughly half of Keck observations are carried out in this way. The Gemini observatories are in the process of transferring science operations from the telescopes to their base facilities in Hawaii and Chile.



Main remote observing sites for the W.M. Keck telescopes

Benefits of remote observing

There are many factors that favour remote observing for observers and observatories alike. These include:

- savings in travel and accommodation costs, and in travel time for observers
- potentially hazardous travel to telescopes is reduced
- threats of extreme mountain weather are avoided
- potential health risks of working in high-altitude, 'hostile' environments are minimized
- observers retain mental alertness at low altitudes, so observing efficiency is greater
- other science team members can eavesdrop, and offer strategic and practical advice
- student training and participation in observing runs can be broadened at little cost
- larger observing campaigns are more easily shared within the science team

- savings in operating costs for observatories
- fewer staff travel travel to telescope, so overall effort is deployed more efficiently
- staff training and refresher sessions are more efficient
- expertise is always readily to hand for daytime troubleshooting

Attitudes to observing vary, even amongst observers…

Disadvantages of remote observing

There are of course several factors that do not favour remote observing. These include:

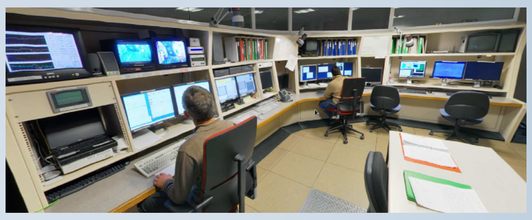
- communications failures with the remote site
- risk that observatory staff and users become detached
- day-time sleeping may be interrupted at sea-level (but can be hard at altitude too)
- communication between observers and night-assistants can be more difficult
- latency in network connections can frustrate the observing experience
- many observers strongly prefer the experience of observing at the telescope

Remote observing infrastructure at ING

The network between ING's sea-level base in Santa Cruz de La Palma and the WHT has a full-duplex bandwidth of 100Mbps, with latency consistently less than 2-msec. The connectivity from the WHT into the Internet has a bandwidth greater than 0.5Gbps.

Virtual Network Computing (RealVNC), which of course is considerably more efficient that X11-forwarding, allows all observing and instrument-control desktops to be displayed and operated efficiently from the sea-level remote observing office. An H.323-protocol video-conferencing system permits two-way audio and video communications between the remote control room and the telescope control room. A software thin layer will generate audio alerts to signal the end of exposures and give other warnings.

The low-latency network connection makes the remote observing experience in terms of GUI operations and general observing procedures only minimally different from being present in the control room.



WHT control room

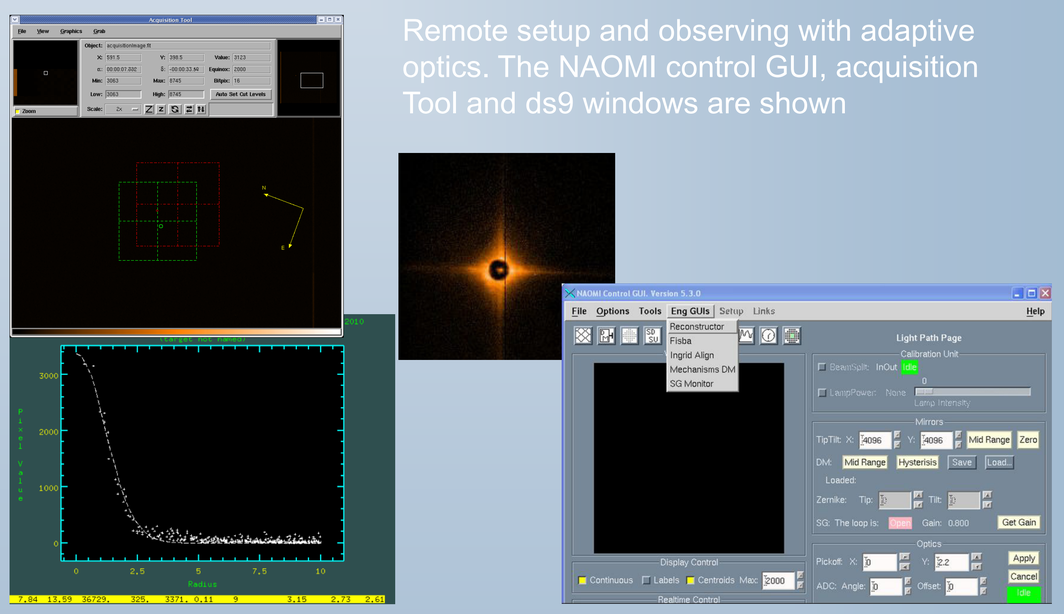
Remote observing room at sea-level

Useage of remote observing at ING

The main useage of remote observing in ING is for afternoon instrument preparation, remote support of visiting lone observers at the INT, training of staff and students, general troubleshooting by experts from sea-level, and service observing.

Remote observing with adaptive optics

Arguably the most complex instrumentation on the WHT is the adaptive optics suite. AO observations are carried out in service mode by staff astronomers, and the remote observing capability from sea-level has played a crucial role in the development of this system. It is used routinely for operations such as mirror-flattening, instrument preparation and trouble-shooting, but has also been used for carrying out AO service observations.



Remote setup and observing with adaptive optics. The NAOMI control GUI, acquisition Tool and ds9 windows are shown

The future

We do not have plans at present to offer remote observing other than from the sea-level base and between the WHT and INT control rooms, and this mainly for staff use and training. But as the observatory evolves to become more engaged with large surveys, it is quite possible that remote observing and eavesdropping modes will assume a more prominent role than is presently the case.

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