Albert Conrad cv details

1. Experience in science support
    a. Overview

    While at Keck I was the instrument master for the second generation near-infrared spectrograph (NIRC2) and supported the near-infrared integral field spectrograph (OSIRIS) and two other instruments (NIRSPEC and HIRES). I also supported laser operations and was a member of the laser guide star (LGS) operations team responsible for documenting procedures, developing software tools, and generally stream-lining that system.

    b. Specific examples

    - I maintained the NIRC2 web page and user's manual. For example, these include instructions for performing calibrations (including calibrations for geometric field distortion to aid astrometry programs, see below).
    - During July 2008 (together with Mike Wagner (!)), I performed trouble-shooting of the Alladin-3 electronics problem. This was an intense effort of 4-days which had to be conducted very carefully due to that electronics being rare and no longer supported by the manufacturer.
    - I created and maintained the NIRC2 page for coordinating astrometry calibration.
    - I documented the effects of exceeding the linear range of the Alladin-3 using my own data (intentionally saturated!) of the lunar surface collected during the LCROSS campaign.

    More information on each of these last three can be found on the NIRC2 news page I maintained:

    http://www2.keck.hawaii.edu/inst/nirc2/nirc2_news.html

    Please see the entries for these dates: 2008-jul-07 ("Transputer Board Replaced), 2008-feb-03 ("Astrometry Page Updated"), 2010-feb-19 ("Keep It Linear", respectively.

    c. References
    Bob Goodrich, Randy Campbell, Greg Wirth, …

2. My knowledge/skill set related to AO science, data processing, and technical aspects.
    a. Overview

    On the science side, together with collaborators, I use adaptive optics on large telescopes to observe small bodies in the solar system. We search for satellites [Merline et al, IAUC, 2013] and analyze the shape and rotation of the primary [Conrad et al, LPSC, 2009]. Our improved shape and volume estimates [Conrad et al, Icarus, 2007] lead to better estimates of composition. Our discovery of a satellite

orbiting (41) Daphne [Conrad et al, IAUC, 2008] resulted in a more accurate density estimate for that object [Conrad et al, AAS/DPS, 2008]. Our main focus has been on the main belt and outer solar system, however we resolve [Merline et al,], and detect [Merline et al, IAUC,2008] satellites around, near-Earth asteroids as well.

On the technical side, at Keck I was a hand-on user of AO and developed support tools on a productive, operational system. At MPIA the work has been primarily lab work, but more hard-core experience with development and calibration. The Pathfinder effort involved both, development and commissioning at the telescope.

b. Specific examples - Science

- Over 100 publications, including 24 in refereed journals, and 7 discoveries documented in IAU circulars (lead discover on moon of 41 Daphne, 2008)
- Co-Investigator of NASA Planetary Astronomy Grant 'Disk-Resolved Imaging of Asteroids.'
- IAU working group member since 2008 [Seidelman et al, CM, 2007; Archinal et al, CM, 2011]
- Commendation from the Director (see figure 7).

c. Specific examples - Data Processing

- Zero points – See "Zero Points Updated" 28-jul-2004 entry on the NIRC2 news page.
- Deconvolution – Applied mistral to resolved asteroid data.

d. Specific examples - Technical

- In the lab at MPIA I directed the PhD student in closed loop experiments with the LN MHWS wave front sensor. [Zhang et al, Optics Express, 2012]
- With Luca Fini and others at Arcetri, and Juergen Berwein at MPIA, I developed the interface to the LBT adaptive secondary (CAOS-LN) [LN-MPIA-ICD-AO-001].
- I lead the Pathfinder effort to commission the LN GWS at LBT (first light 17.nov.2013). See SPIE 2012 (Amsterdam) and design documents (e.g., conceptual design for PF [LN-MPIA-DES-AO-002]).
- At Keck, I specialized in techniques for applying AO to non-sidereal objects, and maintained web pages on this topic (see figure 5).
- I collaborated with Imke de Pater on LGS techniques for observing Jupiter and Io. (see figure 4)
- During October 2008 I worked with Bruce MacIntosh and Christian Marois on a telescope tracking issue that affected their interpretation of ADI data taken on HR-8799. Ultimately it was understood and they published their famous result.
- In April 2008 Randy and I released of the LGSAO differential tracking software. Will Grundy was the first science user. Attached is a slide I presented at a Science Steering Committee meeting following the Grundy success (see figure 6).

More information on each of these last two can be found on the NIRC2 news page I maintained:

http://www2.keck.hawaii.edu/inst/nirc2/nirc2_news.html

Please see the entries for these dates: 2008-nov-2003 (“Fixed Pupil versus Vertical Angle Mode”) and 2008-apr-23 (“LGSAO Differential Tracking Available (Shared Risk)”)

e. References

Carmelo, Bruce MacIntosh, Luca Fini, Thomas Bertram, Maria, Mike Liu, …

3. Past experience supervising/following-up commissioning of "instruments" like LUCI and ARGOS
   a. Overview

   I recently lead the commissioning of the LN Pathfinder at LBT.

   At Keck I participated in the commissioning of 4 instruments: HIRES, LRIS, NIRC2, OSIRIS, and NIRSPEC. I was most involved with HIRES and NIRC2. This was largely software, but involved lots of observing and hardware as well.

   While at Keck I supported laser operations and was a member of the laser guide star (LGS) operations team responsible for documenting procedures, developing software tools, and generally stream-lining that system. I was also the instrument master for the second generation near-infrared spectrograph (NIRC2) and supported the near-infrared integral field spectrograph (OSIRIS). NIRC2 and OSIRIS are the two primary instruments used with LGS at Keck. Though a sodium laser, many of the operational (e.g., FAA, Space Command, safety, etc) and technical (e.g., truth sensor) aspects will be the same ARGOS.

   LUCI AO mode is similar to NIRC2. My experience with slit mask instruments (LRIS and DEIMOS) at Keck (see below) is relevant to the multi-object spectroscopic mode of LUCI, although they are optical/CCD instruments. My experience supporting NIRSPEC is relevant to the seeing limited modes of LUCI, but imaging and long-slit spectroscopy.

   b. Specific examples

   - While on the LGSAO operations team I developed and commissioned the LGS summary display, “LUI” (see figure 1)
   - With my colleagues, Cambell and Goodrich, developing automated efficiency metrics for LGSAO (see figure 2).

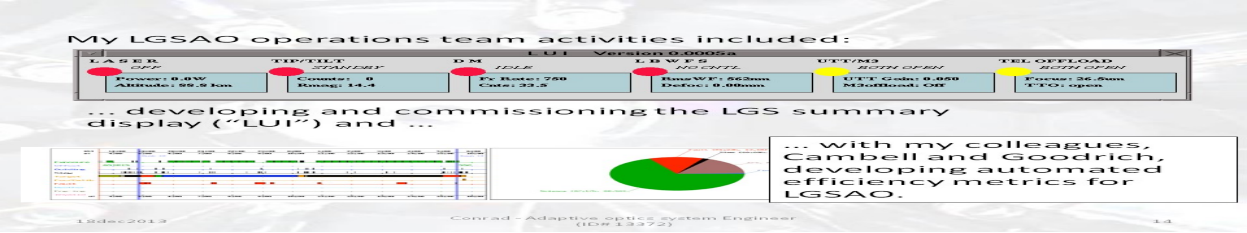
- I provided requirements, a prototype, and beta testing to programmer Shui Kwok, for the Keck LGS AO guide star tool (see figure 3).
- I was a member of the Summit Instrument Activity Schedule (SIAS) development team, and, in particular I automated the process going from observer request to summit activity specification for slit mask requests. See: http://www2.keck.hawaii.edu/inst/siastng/release/web/Sias/siasEh.php

c. References

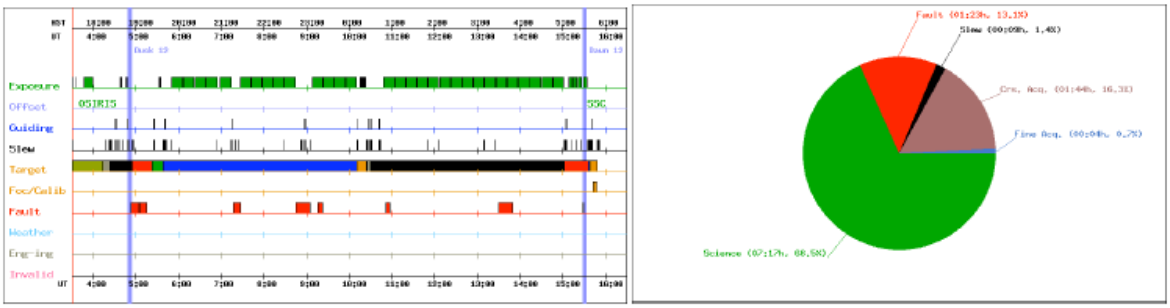
MikeWagner, Randy Campbell, Bob Goodrich, Greg Wirth, Wolfgang Gaessler, Walter Seiffert

Figures

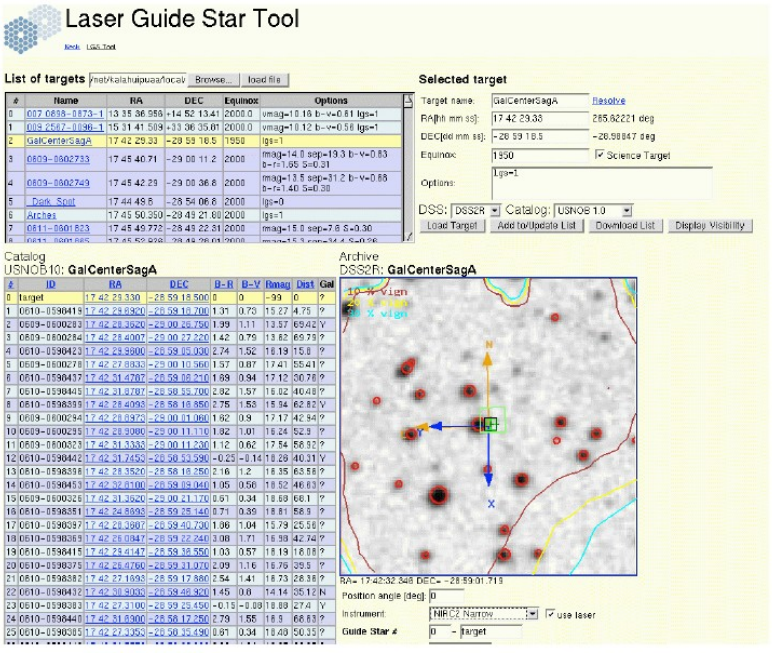
1. LUI



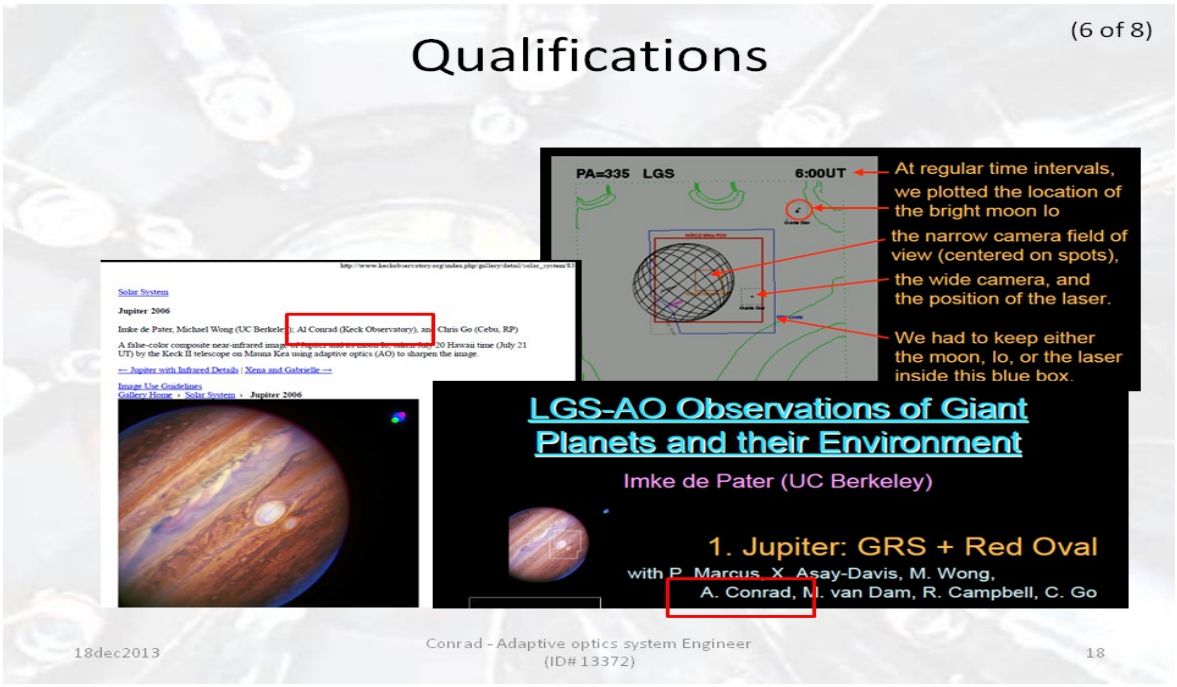
2. LGSAO Efficiency Metrics



3. LGSAO Planning Tool



4. Imke Collaboration



5. Differential Rates

Keck Differential Trackng Rates and Limiting Magnitudes http://www2.keck.hawaii.edu/optics/lgsao/nonsid/nonsidTable.html

Keck Differential Trackng Rates and Limiting Magnitudes

ARC

Last updated 05mar2010

L G S

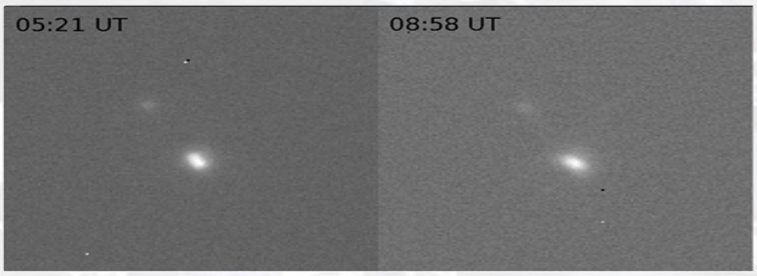
Method	Limiting Magnitude	Limiting Rate	Comment
On-axis; with open-loop-tracking = sidereal	Science Target must be brighter than 18Vmag.	Approx. 20 arcsec/hour	Common
On-axis; with open-loop-tracking = 'correct'	Science Target must be brighter than 18Vmag.	Approx. 0.25 arcsec/second.	Demonstrated once; available as shared risk only.
Offset (e.g., appulse)	Science Target can be very faint; appulse must be brighter than 18Vmag.	Approx. 20 arsec/hour	Tested; available as shared risk only.

6. Grundy TNO Result

(8 of 8)

Qualifications

With Campbell and Stomski, I developed a technique for observing faint KBO with LGS via appulse events.



Two images of the Kuiper Belt triple system 1999 TC36 taken by Grundy&Roe with Keck/LGSAO. The ~2 day orbital motion of the two, barely resolved inner components can be seen in these images separated by 3-1/2 hours. The faint outer component has a 50 day period.

7. Commendation form Director #1

W. M. KECK OBSERVATORY

October 2008

Aloha Al:

Congratulations and thank you for your contributions to WMKO! You were recently recommended for a bonus in the amount of $1,500.00 by Bob Goodrich. This is what Bob had to say about your bonus recommendation.

Recognition for performance on a project or task with strategic significance to the organization.

Al Conrad came into the SA group with substantial background knowledge of WMKO systems. However, he lacked the astronomical observing background that most of our other SAs come in with. These are the two sides of the SA support role: understanding astronomical observing techniques and understanding how these are integrated into the WMKO system. While normally we teach the latter to incoming SAs, we took on the task of teaching the former to Dr. Conrad.

This has worked impressively well. Al is now the SA most active in astronomical research. The list of accomplishments that we can credit AL with include:

- The most active SA in research (16.1% of his time, compared with 10.2% on average),
- Regular publications (two in the past year),
- Regular press releases (also indicating that his research is cutting edge, and entirely newsworthy),
- Successful pursuit of external research funding (which has offloaded WMKO from paying for professional developments,
- Regular presentations (five this past year) at astronomical meetings, included invited talks,
- Active participation in an IAU Working Group.

Al's research has not only benefited his appreciation of different observing techniques, it has led directly to the improvement of existing techniques and creation of new techniques, such as the differential tracking mode of LGS-AO, which allows, for example, observations of one Jovian satellite while locking on another. This is also leading to the development of a vertical angle tracking mode for LGS-AO. Al has also expanded his observing techniques to the optical, recently obtaining LRIS spectroscopy of some scientifically interesting asteroids.

While this recommendation is based mostly on Al's successful research path, there are other Observatory benefits. Al has contributed to two *Cosmic Matters* articles, and has taken the initiative to participate in NASA's LCROSS ground-based support efforts and in a PanSTARRS group. It should also be noted that this summer's work on NIRC2 has increased Al's knowledge of NIRC2 (for which Al is the Instrument Master) and made him more comfortable with hands-on instrumentation work.

Thank you again for your contributions!

Sincerely,

Taft

Taft Armandroff, Observatory Director

Headquarters: 65-1120 Mamalahoa Highway, Kamuela, HI 96743
Phone 808-885-7887 • FAX 808-885-4464

8. Commendation form Director #2

Recognition

AWARD

Presented to

Al Conrad

in recognition of your extraordinary contributions and dedication to our company's goals

through your participation in successfully completing NIRC2 software, allowing NIRC2 to pass Preship Review.

Date August 22, 2001

Signed Frederic H. Chaffee

Director, W. M. Keck Observatory