WIRCam news

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I'iwi pipeline improvements

- Quicker and more reliable: reduced data are distributed one or two weeks after the end of the run
- An entire run can be reduced in a few steps, rather than on a per program basis

Standard stars

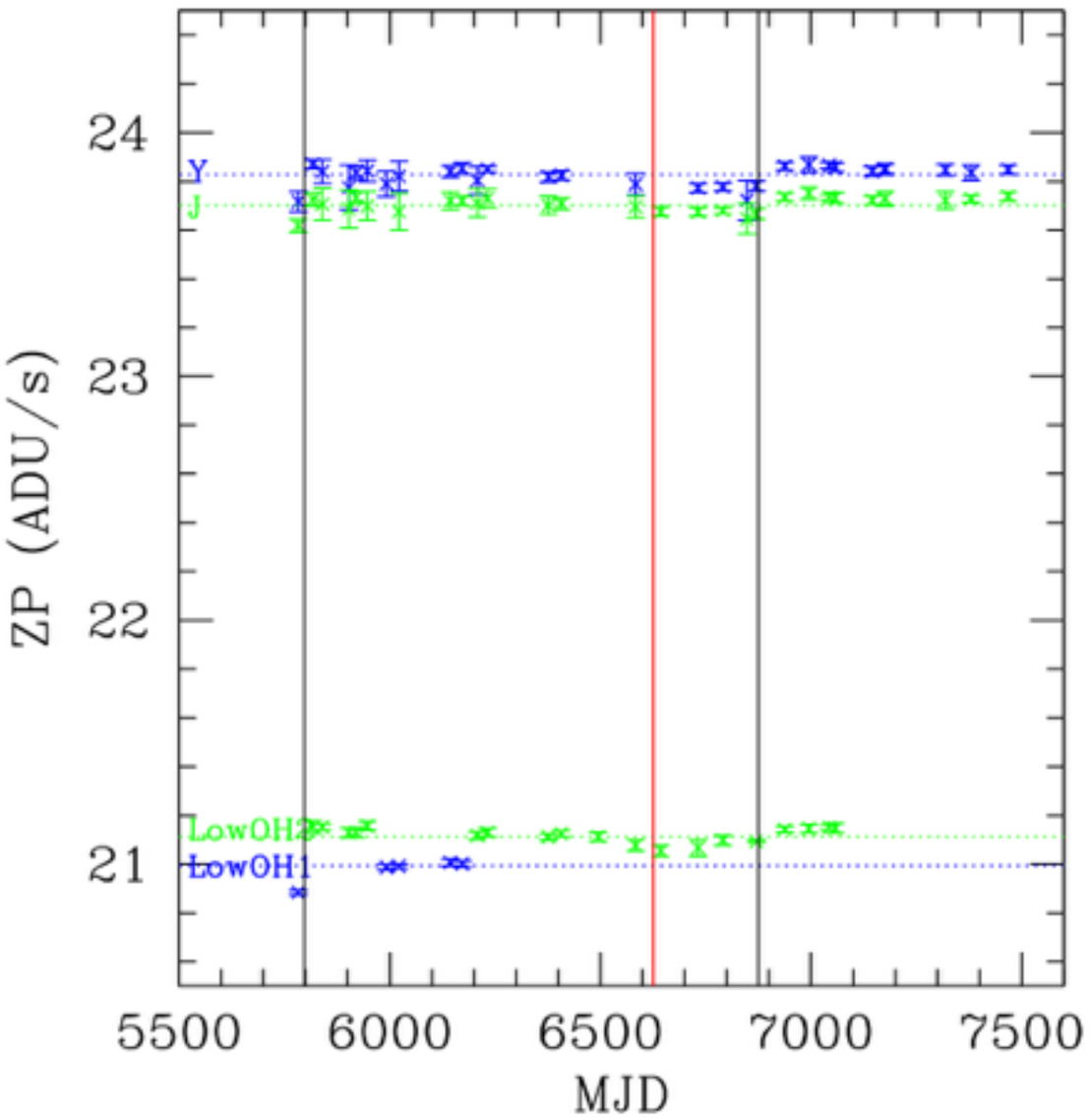
- UKIRT faint standards no longer used

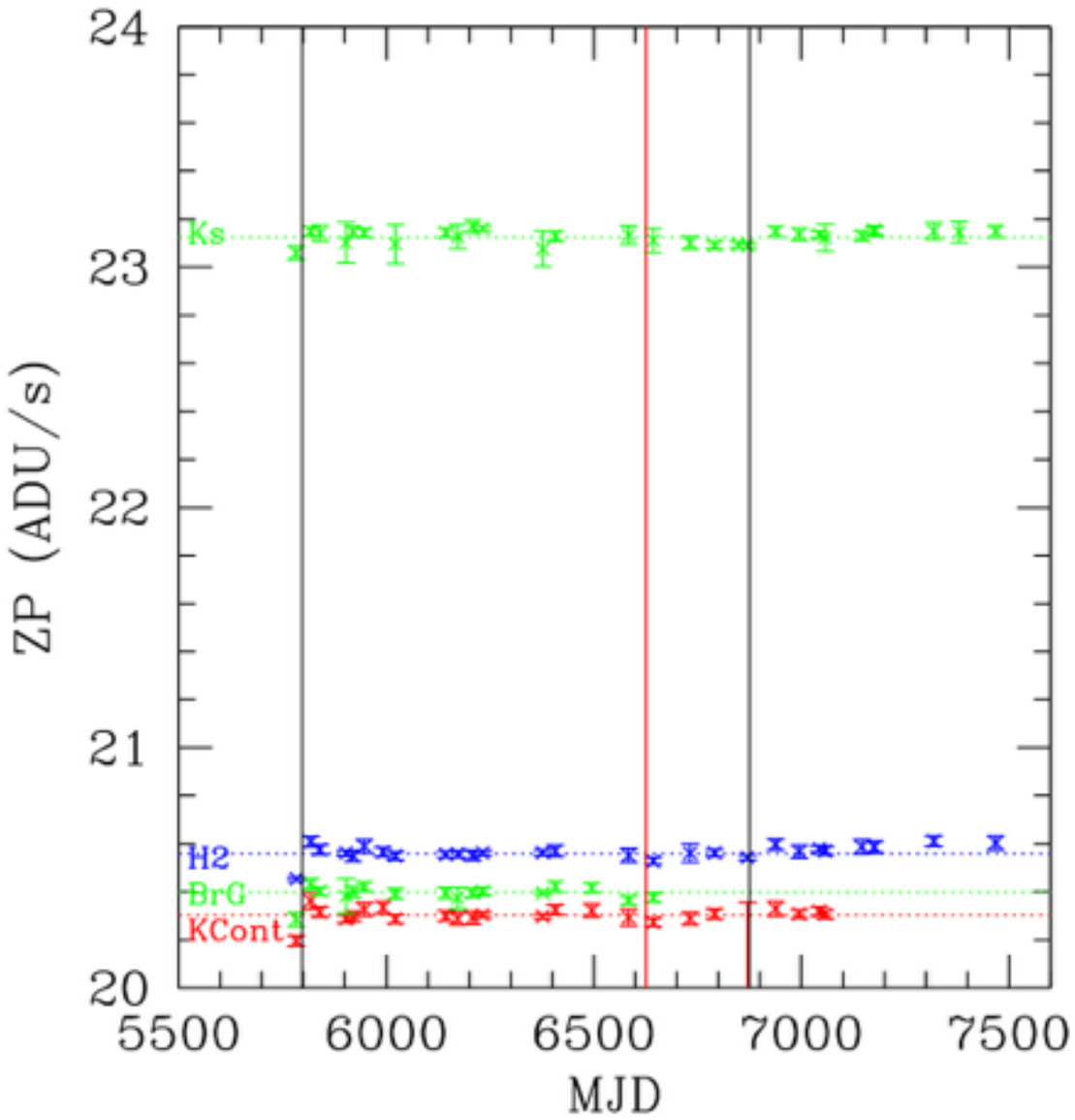
- CALSPEC HST spectrophotometric standards used both for narrow- and broad-band filters

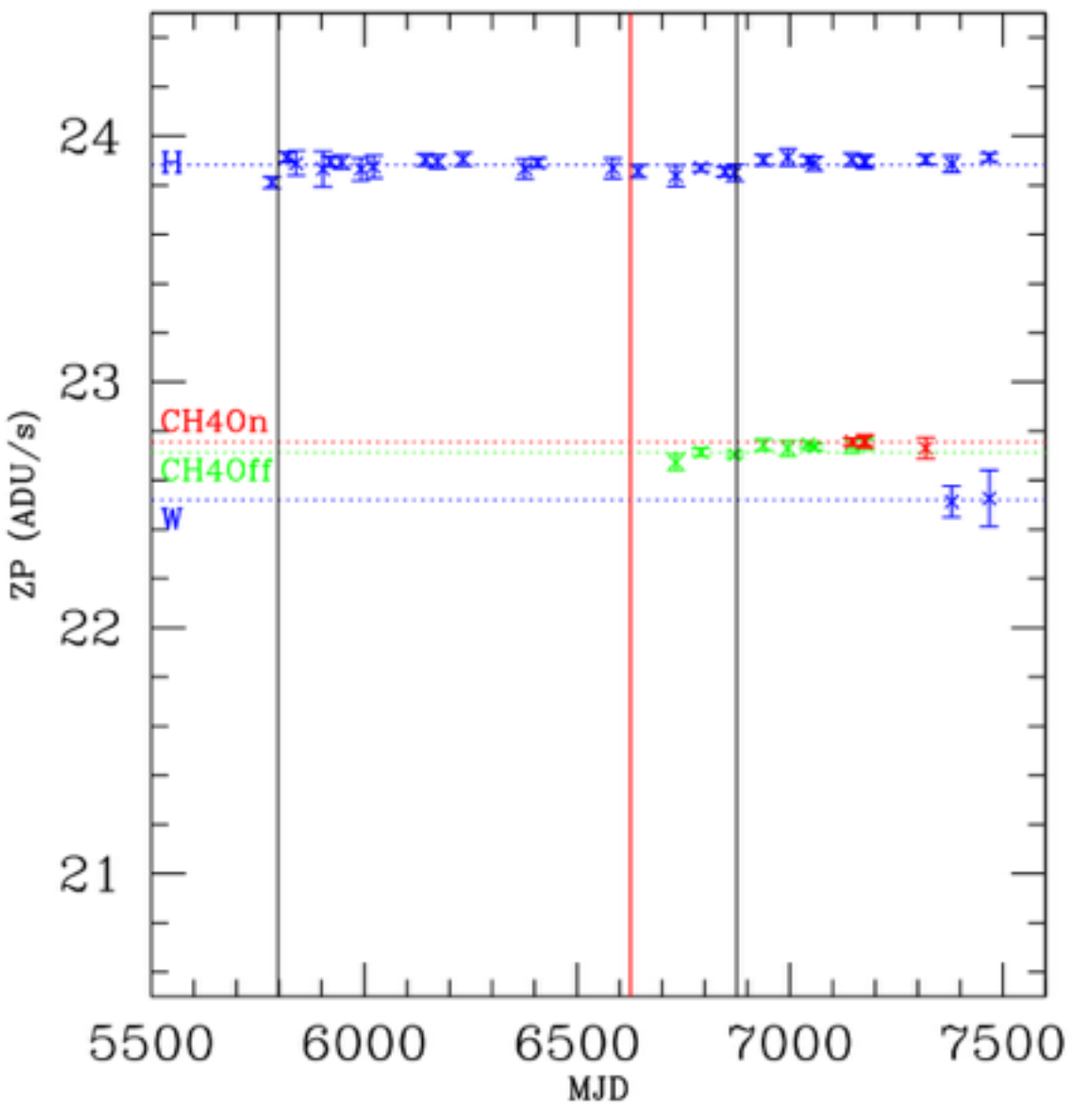
- Refined astrometry avoids ambiguous standard star identification

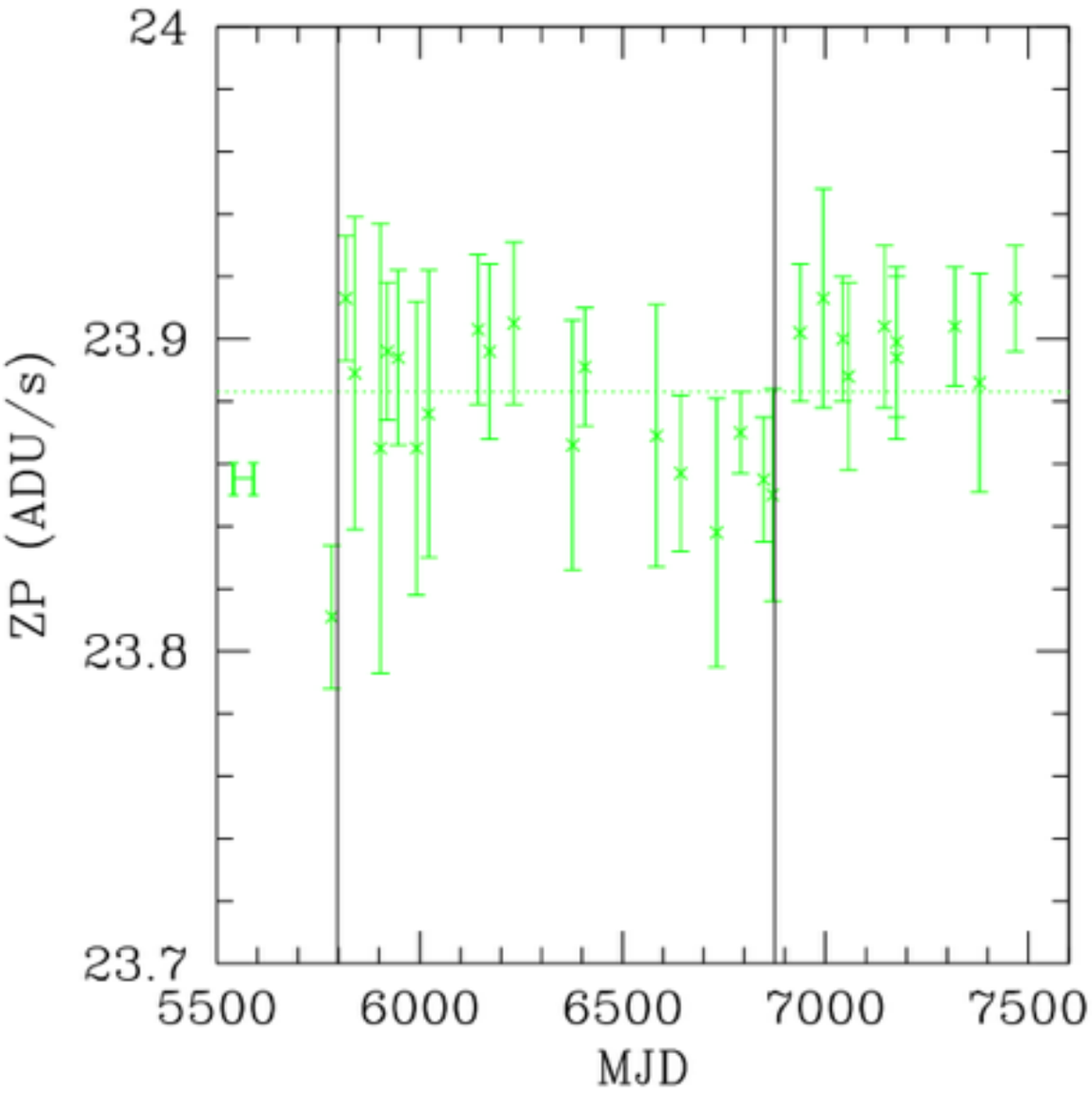
Photometric calibration (1)

- All the calibrations since 2011 were re-reduced
- Zero-points are now very stable and aluminizations are clearly visible as a gain in ZP
- Flat scaling: chip 4 is the reference for ZP rather than averaged over chips
- ZP values accurate to 4 to 8 mmag for all bands in ADU/sec for VEGAmag


24
23
22
21
ZP (ADU/s)
Y
J
LowOH2
LowOH1
5500
6000
6500
7000
7500
MJD


24
23
22
21
20
ZP (ADU/s)
Ks
H2
BrG
KCont
5500
6000
6500
7000
7500
MJD


24
23
22
21
ZP (ADU/s)
H
CH4On
CH4Off
W
5500
6000
6500
7000
7500
MJD


24
23.9
23.8
23.7
ZP (ADU/s)
H
5500
6000
6500
7000
7500
MJD

Photometric calibration (2)

- Good agreement with measured ZP at CADC, using 2MASS and color equations
- Computation of expected ZP from throughput of all elements (atmosphere to detector)
- Good agreement (10%) with actually measured ZP
- Two new filters (C0, W) being characterized

Non-linearity studies

- A much better set of transfer curves was obtained in August 2014
- Non-linearity corrections need to be done pixel per pixel: median values lead to inferior quality
- No need to separately correct individual frames used to compute correlated double-sampling difference image
- New NLC implemented in October 2015: non-significant change in ZP (includes the new flat scaling scheme): 0.0019 +- 0.0042 over 8 filters

Exposure time calculator

- Unified with MegaCam
- Includes realistic galaxy modes: convolution of Sersic with Moffat profiles
- Several photometric modes: PSF, optimal aperture, fixed aperture, large aperture

Sky subtraction

- New sky statistics: redefinition of dark, grey, bright skies: Mauna Kea better in K than other sites

- Standard sky subtraction needs images shifted in time and space: not possible for staring mode used for accurate relative photometry of transits

- Possible application of defringing techniques to sky subtraction

Tracking overheads (1)

- Quest tool reads database; reports:
- Integrated time = validated+not validated +readout+acquire
- Lost = manually reported by RO (TCS, telescope, pointing, engineering, WIRCAM, windscreen, human error) + automatic entry (focusing, QSO)
- Overheads = Max hours-Integrated-Lost-weather

Statistics over recent runs

Run	Qrunid	Dates	Nights	All Exp	Read out	Acq exp + readout	Lost	Weather	Overhead	Total (hours)
13Bw01	13BQ06	Oct 9-27	19	57	24	4	12	91	28	215
13Bw02	13BQ10	Dec 6-26	21	62	29	5	19	112	25	251
14Aw01	14AQ04	Mar 7-23	17	38	18	2	2	112	12	186
14Aw02	14AQ08	May 7-19	13	65	35	3	2	1	22	128
14Aw03	14AQ12	Jul 3-16	14	31	16	2	12	60	14	135
14Aw04/ 14Bw01	14AQ14/14B Q01	Jul 29-Aug 3	6	14	13	2	8	14	7	60
14Bw02	14BQ06	Sep 26-Oct 19	24	64	24	3	11	139	27	268
14Bw03	14BQ10	Nov 26-Dec 11	16	68	37	8	13	35	29	191
14Bw04/ 05	14BQ14/16/1 5AQ01	Jan 20-22, 28-31, Feb 1-11	18	52	26	4	4	98	25	210
15Aw01	15AQ07	Apr 28-May 11	14	48	25	5	5	33	25	140
15Aw02	15AQ09	May 27-Jun 8	13	55	35	4	4	6	21	125
15Bw01	15BQ04	Aug 20-25	6	5	3	0	2	47	4	62
15Bw02	15BQ09	Oct 20-26	7	33	16	3	4	6	17	80
15Bw03	15BQ15	Dec 17-27	11	34	16	2	4	59	16	132
16Aw01	16AQ05	Mar 17-21	5	26	10	2	2	0	15	54

Tracking overheads (2)

- Overheads amount to 0 (?) to 3.5h per night: why ?
- Basically 3 components: pointing (+ filter change), acquisition startup, telescope dithering pattern offset
- difficult to estimate: depends on DP, target locations, observing mode (staring, WDP, nodding)
- estimate for a few nights: assume 14.2s per acquisition setup and 8.7s per regular DP (12 per WDP)
- Run 16Aw01: Quest reports 2.96h and 2.97h of overheads on March 17 & 18
- But integration time includes 10sec per image charged to the PI. Readout only takes 4.8sec so 5.2sec of overhead is already included
- our estimate gives 0.89+0.66+1.80-1.03=2.32h and 0.86+0.24+2.61-1.14=2.57h
- OK within 0.5h

Time decomposition of a night

- Analysis of 204 WIRCam nights from 13Bw01 to 16Aw01
- 11h per night available in average
- 3.0h validated, 4.4 including readout, 4.8 including not validated, 5.2 including acquisition and focus, 6.6 including overheads
- 4.0h lost to weather, 0.4 to engineering and problems: 6.6+4.4=11h

Astrometric calibration (coming)

- Real-time astrometry given by 2MASS source extraction and comparison
- I'iwi determines a global astrometric solution then "refines" for each chip
- CADC has been complaining about degradation of results
- catastrophic in crowded fields
- envisioned solution: remove astrometry from I'iwi and use Astromatic software to do it
- possibility of delivering stacked images

Thanks to

- Simon Prunet for common ETC, numerous discussions, in-depth understanding of magnitude systems, defringing techniques, ...
- Kanoa Withington for initiation to WIRCam pipeline, many discussions and I'iwi improvements
- Nadine Manset and Todd Burdullis for help with QSO tools, QC training
- Wei-Hao Wang and An-Yi Bu for detailed work and discussions on non-linearity corrections
- Stephen Gwynn for comparison with his work on WIRCam images at CADC
- Tom Vermeulen & Jim Thomas for helping me to understand overheads