Kumeu Observatory

- Guy Thornley
- 28 yo
- Systems software engineer
- Experienced visual observer
Kumeu Observatory

- David Moorhouse
- 28 yo
- Electronics Technician public television
- Telescope builder
- Astrophotography
TVNZ outside
Dave at play
Rock on
- High Ground 110 Meters
- Not affected by fog
• Town Plan doesn’t allow
• 10 acre blocks to be broken up
Nap Time
Tea
Time
Kumeu Observatory Timeline

• 1980 Main structure was built by property owner Steve Calveley
  – with old steel dome, grass roof
  – 12” Maksutov Cassegrain

• 1988 Roll off roof Mark Boss, Gordon Herdman
  – The secret weapon was developed
  – Site was underutilised for years

• 2000 new wooden dome with
  – Meade 10” LX200

• 2003 David Moorhouse, Guy Thornley, Paul Kemp
  – looking for new visual observing site
  – only doing visual work
Kumeu Observatory Timeline

• 2004 Decided to get the LX200 going
  – and failed, due to very bad periodic error (>1.5 arc-min!)

• 2005 Celestron C14 fork mount
  – moved to Kumeu fitted with 10” Meade OTA
  – Started doing work for CBA

• 2006 Wasp observatory was built for astrophotography

• 2007 Nustrini C14 OTA moved to Kumeu
  – Had first go at microlensing run hampered by cloud

• 2008 Automated dome
  – First serious microlensing season several good runs
Current Equipment

• Celestron orange tube C14
  – fork mount non-goto
  – ~ 28 yo
  – On long term loan from the Nustrini family
  – Modified for autoguiding
  – Byers gears

• ArgoNavis
  – Digital setting circles
  – Provided by AAS

• Rigel Quickfinder
  – Used for one star alignment
Current Equipment

• Lesve Dome
  – ASCOM compliant dome driver
  – based about cheap hardware
  – Position sensor wheel and home sensor

• Boltwood cloud sensor
Cloud Sensor

Kumeu Cloudy Station

Sky is Cloudy.
Current Equipment

- SBig ST7
- CFW8 with V filter
- Celestron x0.63 focal reducer
- JMI motor focus
  - Semi manual, digital readout
  - Not computer controllable
- Computer
  - Various hubs, power supplies, dew heaters, cables etc
  - All supplied by Dave
Current Software

- MaximDL V5 Pro Suite
- GSC and UCAC2 catalog for plate solving
- ASCOM L5
- Lesve Dome driver
- PemPro
- CCD Inspector
- ACP Automation trialled in Wasp
- The Sky Six
Work flow processes

- 25 to 40 minutes typically to startup
- Every 20 min re-focus for first 2 hours
- Every hour after that (5 min each time)
- Using CCD inspector to watch focus trends
Work flow processes

- Images are put onto ext hard drive
- Usually processing is done at home next day after sleeping
- Upload from home to FTP server
Work flow processes

• Startup
  – Starting PC, MaximDL, dome driver, mount, Argonavis
  – Manually aiming scope & dome at bright star
  – Centring star on focus window in MaximDL
  – Choosing and syncing star in Argonavis
  – If this is a new target setting up RA Dec and name in Argo
Work flow processes

- Cont
  - Doing a manual focus run
  - Push telescope to target, zeroing numbers on Argonavis
  - Taking a 30 sec pointing exposure
  - Plate solving using MaximDL
  - Changing cursor to Astrometric mode
  - Seeing where the target actually is on the plate
Work flow processes

• cont
  – Using short 5 sec exposures in focus mode
  – Centre the target using hand pad
  – Double check RA Dec and compare to image on webpage
  – Setup autoguiding
  – Setup MaximDL sequence to take 5 min exposures
  – Start sequence
Image Calibration

- Dusk flats taken when ever possible
- Dusk flats are either 1 or 2 sec
- Dusk flat darks of 1 & 2 sec taken
- Manual push of telescope between exposures during download time
- Darks of 5 min duration usually taken before or after time series run
Image Calibration

• MaximDL is used for Calibration of images
• Images are calibrated using Darks and Flats with no dark scaling needed
• MaximDL has powerful batch processing abilities
Image Calibration

- Images are autoguided so batch processing of image cropping is possible
- Animation of images for visual quality check
- Manually finding the XY star position, then setting up a crop to give me 500x500 finished images
- Entire dir is zipped using winzip
Acquisition team goals

• Max time coverage of events

• Overlapping between teams

• Technically perfect images
  – Focus
  – Tracking
  – Calibration
Acquisition team goals

- Timely uploading
- Quick response
- Collaboration with other teams
- Time management with day job
Current Obstacles

- Medium quality mount needs guiding
- Clouds cause autoguiding to fail
- Focus changes rapidly during evening
- Focusing late night is error prone
- Celestron focal reducer not optimised
Current Obstacles

• Non Goto mount causes issues
  – needs initial alignment
  – Can’t auto re-centre using plate solving
  – Start-up sequence is complicated
  – Therefore it can’t be done by neighbours

• Good time management is not possible as we can’t begin to leverage automation products

• A single dome PC means images are taken home to process, rather than risk losing image capture time
Current Obstacles

- Quick response is difficult via irregularly checked E-Mail
- Both David and Guy work late 10pm on a regular basis
- We can’t remotely run observatory even with someone else onsite (Steve or Alan)
- If it’s partly cloudy we often won’t go due to next day work commitments
Improving our output

• Top results need
  – Solid equipment
  – Solid repeatable processes
  – Allowing technology to improve time management
Improving our output

- Autofocus
  - Computer controlled temp compensating focuser
- Mount
  - Replace or upgrade to goto
- Focal reducer
  - Argos reducer tube to allow correct spacing
- Second PC
  - for image processing
- Automation
  - ACP allows a truly autonomous amateur observatory to be a reality and time wasting tasks to be done automatically
Improving our output

• Using 10” Meade in Wasp
• Using Skype for communication

• No Sleep is a MAJOR for everyone this can be improved with better systems and equipment
What is ACP

- Complete software solution for observatory automation
- Automates
  - Object acquisition
  - Telescope re-centring
  - Focusing
  - Autoguiding
  - Dome control
  - Weather safety
  - Entire image taking process
  - Dusk or Dawn Flats
- Either un-attended or remote operation
- Web based interface
- Enabler of better time management
Us and uFun

- It has been a pleasure to work with this group
- Andy and Subo’s regular prompt feedback is a major incentive to maintain enthusiasm
- We are 110% committed to this project