Imaging the Southern Sky from Chile

Objects, tips and planning

The Webb Deep-Sky Society Annual Meeting 2017 - Bernhard Hubl

The beginning ...

... A meeting of four guys of the CEDIC team

- Christoph Kaltseis
- Herbert Walter
- Wolfgang Leitner
- Bernhard Hubl

Discussing and planning the CEDIC conference

After several beers a new idea was born!



The idea ...

 Let's visit Daniel Verschatse's new Chilean location for astrophotography – Hacienda Los Andes!





First thougths

 None of us has ever done an astrophotography trip to the southern sky.

- How should we start?
- What do we want?
- What do we need?



Do we need a jeep?



Do we need horses?



Are we greenhorns?





The solution

- Planning
- Planning

Planning



Six tips for ...

 ... maximizing the output of an astrophotography journey to the southern sky

Tip #1 Prefer running systems

 Reduce the number of unknown interfaces and parameters of your setup(s)
 Prefer complete running systems

Bring or Rent

B - Bring R - Rent

Option	Mount	Telescope	Camera	Laptop	Ease of use
А	В	В	В	В	+++
В	R	В	В	В	+
С	R	R	В	В	-
D	R	R	R	В	+
E	R	R	R	R	++

- Option A: best, but only for very light mounts (star tracker)
- Option E: best solution for heavy systems

Setups at Hacienda Los Andes

Mainly option E (rent complete running system)



Astro-Physics Starfire 130 EDF GT

AP130 EDF GT
f/6.3
f=819mm
SBIG STL
Alt AD5



Astro-Physics Starfire 175 EDF

AP175 EDF
f/8.0
f=1400mm
FLI PL 29050
AP1200GTO
Roll-off roof





RCOS RC 14.5" f/9.0

f=3315mm
FLI PL16070
AP1200GTO
Clam Shell



TEC 500 RC 20" f/9.0

f=4572mm
FLI PL16803
AP1600GTO
Cabrio Dome





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Widefield

Mainly option A (bring own complete system)

Star tracker mounts

- Several Astrotrac's
- Vixen Polarie
- Telephoto lenses
 - Nikkor 200mm f/2.0
 - Canon EF 200mm f/2.8
 - Canon EF 135mm f/2.0

Several wide-angle lenses

Tip #2 Location and time

- Choose a location with excellent equipment and service
- Choose a location and a time with the highest probability for clear nights
- Especially important for the first trip
- Chile is perfect in February



Location



Location



Location



Hacienda Los Andes Ovalle, Region IV Hurtado CHILE

30°17'50" S 70°42'44" W Sea level: 1100m

www.haciendalosandes.com

Tip #3 Travel in a team

- A team is more productive than individuals
- Planning within a team
 - Reduces risk that important issues are overlooked
- Use components together
 - Star tracker, flat field foil, telephoto lenses, ball heads, ...
- Solve problems together
- The most important advantage: More fun!



Tip #4 Run cameras in parallel

Requirements:

- Follow tips #1 and #2 (perfect setups and location)
- Careful object planning (tip #6)
- Each team member can run 2 to 3 cameras
- Camera 1: main CCD camera
 - Long focal length
 - Always priority 1
- Camera 2: Piggy-back on main system
 - DSLR with a small refractor or telephoto lens
 - Main system and piggy-back point in the same direction
 - Not always useful
- Camera 3: star tracker
 - DSLR with telephoto lens or wide-angle lens



Tip #5 Setup planning

Gather information about ...

- Components: Optics, mounts, filters, cameras, laptops, software, guiding
- Restrictions and basic conditions: mounting of piggyback optics, flat fielding
- Include also potential components
- Create detailed lists

Data of potential cameras

CHILE 2014	Setuplisten Herbert Walter v9								
C A M E R A	CCD	Filter	DSLR	CHIP	x [mm]	y [mm]	Pixel [µ]	Pixel x	Pixel y
Daniel	FL PL 16803	Astrodon LRGB HSO		FL PL 16803	36,8	36,8	9	4096	4096
	FL PL 16070	FL LRGB, Astrodon HSO							
	FL PL 29050	FL LRGB, Astrodon HSO		FL PL 16070	36	23,9	7,4	4864	3232
	FL PL 29050	FL LRGB, Astrodon HSO							
	SBIG 11000	LRGB HSO		FL PL 29050	36,2	24,1	5,5	6576	4384
Christoph	QSI 8300m - inkl. (!) netbook	L/R/G/B ? 1,25"	Nikon D800E	SBIG 11000	37,25	25,7	9	4008	26
	? OSC ?		Nikon D800E + Nikon 200mm f2.0						
			Nikon DF	8300	18	13,5	5,4	3326	2504
Herbert	Moravian 8300m	L/R/G/B/Ha/OIII 1,25"	Canon EOS 6D	4000c	15,2	15,2	7,4	2048	2048
Wolfgang			Nikon	2000XM	11,8	8,9	7,4	1600	1200
			Canon 1100Da						
				Canon EOS 6D	36	24	6,25	5496	3670
Bernhard			Canon EOS 6D						
			Canon EOS 1000D	Canon EOS 1000D	22,2	14,8	5,7	3888	2592
				Canon 1100Da	22,2	14,8	5,2	4272	2848
				Nikon D800E	36	24	4,88	7378	4924
				Nikon D700	36	24	8,45	4256	2832
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Tip #5 Setup planning

Decide all open questions:

- Fix all components of all setups
- Who is responsible for which setup?
- Which parts of your own equipment are necessary?

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Data of potential setups

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													10					
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za		INKI. Retractor AP Traveler 105 EFS, 4.1"/fb	nein		600	Canon 1100Da			1,79	127 x 85	EOS Utility			Herbert	ja	×	fur CanonDSLR vorhanden	Folie
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9		Capon EE200 (Bernhard)		Astrotrac	200	EOS 6D				619 x 413	EOS Utility		BNet7	Bernhard	×	×		Folie
10		Canon EE135 (Daniel)		Astrotrac	135	EOS 6D				917 x 611	EOS Utility		BNet7	Bernhard	x	x x		Folie
11		Canon EE200 (Herbert)		Fornax10	200	EOS 6D				619 x 413	EOS Utility		H8	Herbert	x	x		Folie
		Canon EF200 (Herbert)		Tomaxio	200	Moravian		LEGEH		309 x 232	EOS Utility Maxim ⁽⁸⁾		H8	Herbert	x	x	für Canon Objektiv ⁽¹⁰⁾	Tone
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Tip #6 Object planning

- Planning phase > 3 months
- 10 different setups
- 260 potential objects
- Overbook each main setup by a factor of 3
- Usage of a software (e.g. CCD-Guide)

What is CCD-Guide?

CCD Guide 2017



- Project of AAS
- Publication of the best images on DVD
- Yearly update

Highlights of CCD-Guide



>5000 images of 53 astrophotographers

- Image + data browser
- Deep sky object database
- Easy to search and to filter
- Slide show
- Input your own images
- Planner
- Minimal system requirements



Planning with CCD-Guide

Create setups (= telescope + camera)

Se	tups					
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0	Camera	FLI PL29050	Focallength (mm)	1400		
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ObjectBrowser

Access to 35,000 objects Filter

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NGC 3496 Open	i Star Cluster	lll1m		10h 59m 36.0s	-60° 20' 12''	Carina	7	8,2	
NGC 3519 Open	Star Cluster	III2p		11h 04m 02.7s	-61° 22' 05''	Carina	8	7,7	Export to Planne
NGC 3572 Open	i Star Cluster	12m		11h 10m 26.6s	-60° 14' 38''	Carina	7	6,6	

FOV image



Summary: Planning works ③

- 3 weeks, 4 guys, 10 cameras (CCD + DSLR)
- Over 300 hours exposure time (only CCD!)
- Over 500 GB raw data (CCD+DSLR)
- Over 1 year of image processing
- Over 100 very good images
- ♦ 3 APODs

Southern nebulae catalogues

 Many well known nebulae catalogues with "southern gaps"

	North	South
HII regions	Sh2	
Reflection nebulae	vdB	
Dark nebulae	B LDN	
Cometary globules	-	

Southern nebulae catalogues

 Many well known nebulae catalogues with "southern gaps"

	North	South
HII regions	Sh2	Gum RCW
Reflection nebulae	vdB	vdBH
Dark nebulae	B LDN	Sandqvist SL DCLD
Cometary globules	-	CG

Southern HII regions

Gum

- Colin Stanley Gum, Australia
- 1955 "A study of diffuse southern H-alpha nebulae"
- wide-angle images
- 84 emission nebulae
- Gum 12 = Gum Nebula
- RCW (Rodgers, Campbell, Whiteoak)
 - Mount-Stromlo Observatory in Australia
 - 1960 "A catalogue of H $\alpha\text{-}emission$ regions in the southern Milky Way"
 - 182 objects

Gum 15 = RCW 32 in Vela

CED 106n| Chile Hacienda los Ándes | 24x480s - L & 8x480s.R/G/B | AP 175 f8 | FLI 29050 | © Christe



Gum 14 NGC 2626 Gum 15 Gum 17 Vela SNR Gum 20



Southern reflection nebulae

van den Bergh & Herbst (vdBH)

- Sidney van den Bergh + William Herbst
- Survey at Cerro Tololo Inter-American Observatory in Chile
- 1975 "Southern stars embedded in nebulosity"
- 136 objects



Southern dark nebulae

Sandqvist-Lindroos (SL)

- 1975 "Interstellar Formaldehyde in Southern Dark Dust Clouds"
- 42 dark nebulae with declination between -33° and -46°
- Study of Whiteoak Survey (48" Schmidt telescope)
- Very interesting objects because of high opacity

Sandqvist

- 1977 "More Southern Dark Dust Clouds"
- 95 additional dark nebulae with high opacity
- Declination below -42°
- Study of ESO (B) atlas
- Numbering starts with Sandqvist 101







α Centauri

Sandqvist 172

Sandqvist 169 Sandqvist 171

Sandqvist 166

Sandqvist 170

Sandqvist 165

More southern dark nebulae

DCLD

- 1986 "A catalogue of southern dark clouds"
- Hartley et al
- ESO/SERC Southern J survey (UK Schmidt Telescope)
- 1101 objects with declination below -33°
- Counterpart to LDN catalogue
- Density: A-B-C (A very dense)





Cometary globules

Cometary Globules (CG)

- 1976 defined as separate object class
- Definition
 - Small isolated dark clouds
 - Dense core
 - Long tail
 - Surrounded by bright rims
 - OB associations in HII regions
- Most of the CGs are inside the Gum Nebula

