

Exoplanets from Antarctica

ARENA & ICE-T

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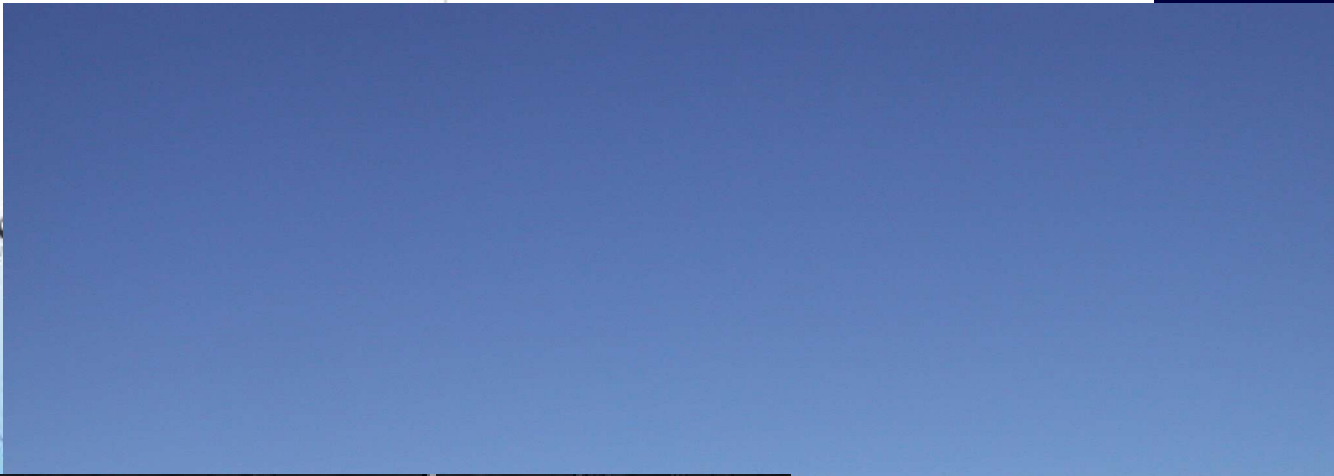
Institut d'Estudis Espacials de Catalunya

Madrid, January
2006



ARENA

- **The Antarctic Plateau provides unique environmental conditions for astronomical observations**
- **Antarctica is a possible site for the construction of a new large observatory (CONCORDIA @ Dome C):**
 - **Low thermal emission (infrared)**
 - **Excellent image quality* (high angular resolution)**
 - **Excellent photometric stability and time coverage (exoplanets)**
- **ARENA (*Antarctic Research, a European Network for Astrophysics*)** Structure and reinforce European institutes and operators to be involved in Antarctic astronomical investigations to setup large instruments and focal equipments in the coming decade
- **A programme of the Large Research Infrastructures of the European Commission FP6**



S 75° 06' 9,8''
E 123° 19' 9,7''
h = 3233m a.s.l.

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The ARENA consortium

Acronym	Country	Institute	contact
CNRS	France	Centre National de la Recherche Scientifique, Paris	N. Epchtein
INAF	Italy	Istituto Nazionale di Astrofisica, Rome	M. Candidi
MPIA	Germany	Max Planck Institut für Astronomy, Heidelberg	T. Henning
AIP	Germany	Astrophysikalisches Institut Potsdam	K. Strassmeier
UGR	Spain	Universidad de Granada	C. Abia
IEEC/CSIC	Spain	Institut d'Estudis Espacials de Catalunya, Barcelona	J. Isern
IAC	Spain	Instituto de Astrofisica de Canarias, Tenerife	E. Martin
UNEXE	United Kingdom	University of Exeter	M. McCaughrean
UNIPG	Italy	Universita degli Studi di Perugia	M. Busso
IPEV	France	Institut Paul Emile Victor, Brest	G. Jugie
DLR	Germany	Deutsches Zentrum für Luft und Raumfahrt, Berlin	H. Rauer
OP	France	Observatoire de Paris	S. Bensammar
CEA	France	Commissariat à l'Energie Atomique, SAp, Saclay	P.O. Lagage
ULG	Belgium	Institut d'Astrophysique et de Géophysique de Liège	J. Surdej
PNRA	Italy	Programma Nazionale di Ricerche in Antartide, Rome	
UNSW	Australia	University of New South Wales, Sydney	J. Storey
SHAK	France	SHAKTIWARE, Marseilles	D. Rabaud
AMOS	Belgium	AMOS, Liège	G. Blanchard
SESO	France	SESO, Aix-en-Provence	D. Fappani
CAUP	Portugal	Centro de Astrofisica da Universidade do Porto	P. Garcia
ESO	Germany	European Southern Observatory, Garching bei München	J. Melnick

ARENA is structured in 5 network activities (NA)

Activity	Descriptive	Short description and specific objectives of the activity
NA1	Management of CA	Coordinates all activities and takes care of the proper circulation of information between the network activities. Reports to the Commission.
NA2	Site Quality Assessment	Long term (3-yr) monitoring of key environmental parameters used to assess the quality of the site for the possible implementation of large astronomical facilities at Dome C.
NA3	Toward Large Astronomical Instruments in Antarctica	Investigates the special constraints imposed on the design of large instruments by the Antarctic environment. Studies optimisation of optical /IR instrument, robotisation of telescopes, focal instruments, and mechanical-optical configurations.
NA4	Logistics and Operations at Dome C	Identifies question related to establishment, operations and maintenance of an astronomical observatory at Dome C adding value to CONCORDIA.
NA5	Which Astrophysics at Dome C?	Identifies key astrophysical programmes to be carried out in Antarctica that complement those already in progress or planned in conventional ground based observatories or with space missions. A science steering committee will publish a rationale of the science programmes and instrumental recommendations to reach the scientific objectives and a timeline for instrumental development at Dome C.

Details of NA5

Task	Taskleader	Title			
5.1	M. Busso/M. McCaughreran	Wide field imaging surveys in the thermal infrared			
5.2	P.-O. Lagage	New windows in the far Infrared			
5.3	H.Rauer	New domains for ground based high precision and long duration time-series photometry and spectroscopy	5.3.1	E. Fossat	Asteroseismology and Helioseismology
			5.3.2	H. Deeg	Photometric search for extrasolar planets
			5.3.3	K. Strassmeier	Solar-stellar connection
5.4	F. Vakili	Obtaining the ultimate angular resolution			
5.5	C. Abia	Spectroscopy and spectro-imagery			

Deliverable No	Deliverable title	Delivery date	Nature	Task
D5.1	Proceedings of Conference 1	10	Proceedings	All tasks
D5.2	Proceedings of Conference 2	22	Proceedings	All tasks
D5.3	Proceedings of Conference 3	34	Proceedings	All tasks
D5.4	Executive summary of recommendations to the National and International Agencies (ESO-ESA) for an astrophysical programme at Dome C	36	Book	All tasks

Planned meetings

Year	Type	Title	Date	Venue
2006	Meeting	Kick-Off meeting	January 13	Nice
	Workshop	“Wide Field Telescopes”	TBD	Paris
	Joint OPTICON-ARENA Workshop	“Interferometry”	April	Observatoire de Haute Provence
	1st ARENA Conference	“Large astronomical optical/IR infrastructures at CONCORDIA, prospects and constraints”	October 16-19	Centre de conférences du CNRS de Roscoff (Brest), France
	Workshop	IRAIT	-	Perugia, Italy
2007	2nd ARENA Conference	“Astrophysics at Dome C”	-	Berlin
2008	3rd ARENA Conference	“A large astrophysical observatory at Dome C for the next decade”	-	?, Italy

ICE-T

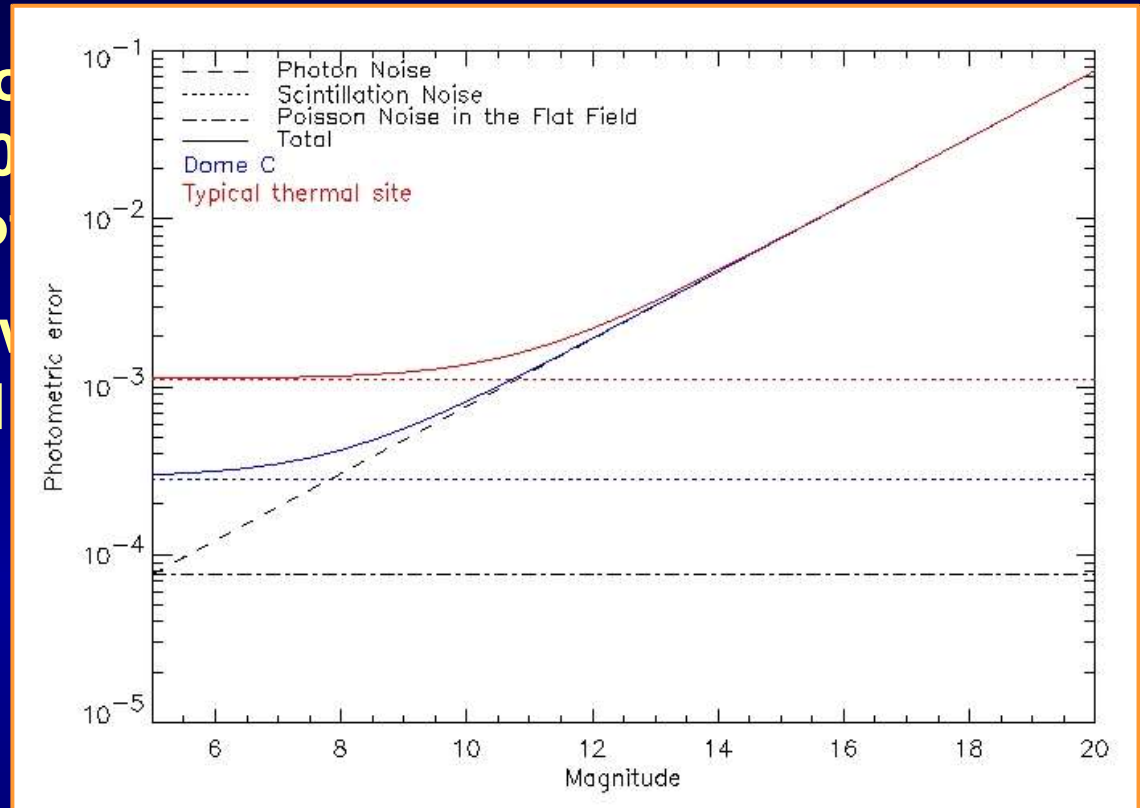
- **The *International Concordia Explorer Telescope***
- **Stellar variability survey between 8-21th mag along three representative star fields in the Milky Way**
- **Continuously observed for the entire polar night of approximately 100 “regular nights”**
- **Core scientific objective:**
 - **Detect transits of extra-solar planets (rem. Jupiter 10-20 mmag; Earth 80-150 μ mag)**
 - **Investigate the combined effects of extra-solar planets, stellar magnetic activity and non-radial pulsations on the structure and evolution of stars**

- **Photometric precision:**

- Up to 200 μmag for faint stars
- 0.3-1 mmag for 30th mag
- 1-4 mmag for another 10th mag

- **Simultaneously in two bands** (e.g. 'i' or Johnson V and B)

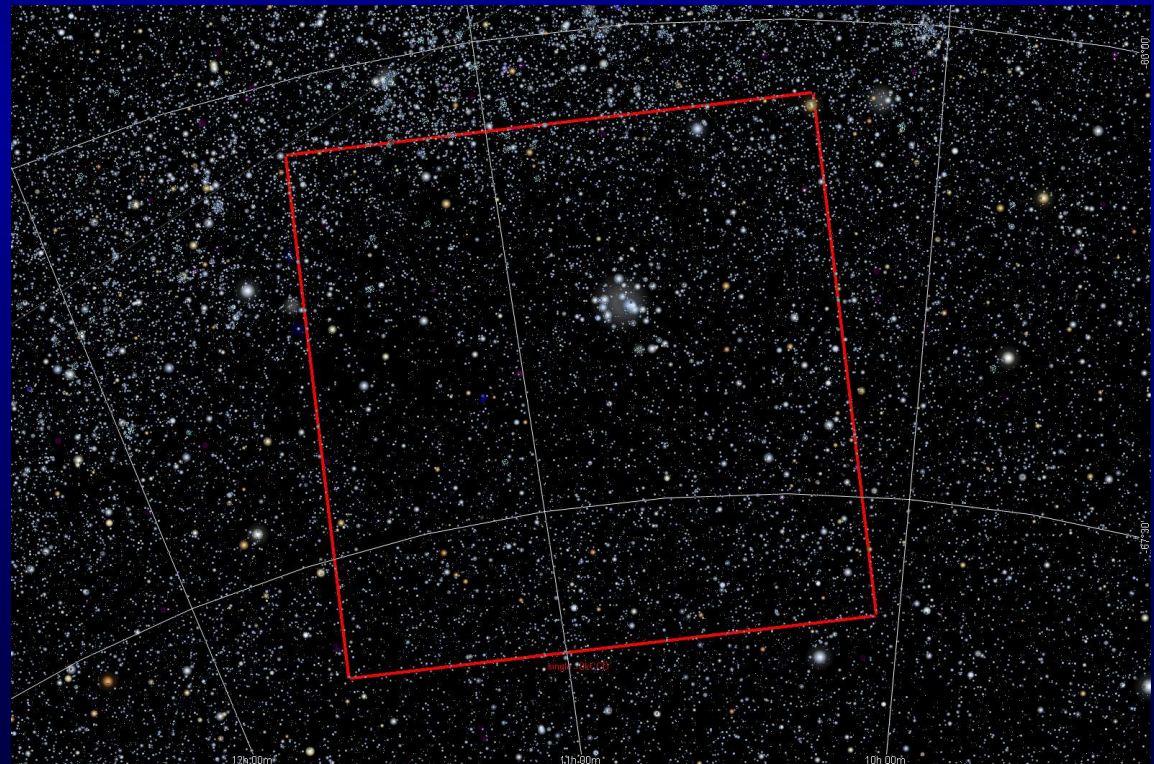
- **Ultra-high precision for stars brighter than 10th mag**
negligible scintillation



Single 10-sec exposures at Dome C and at a thermal site, all for a telescope with $D=60\text{cm}$.

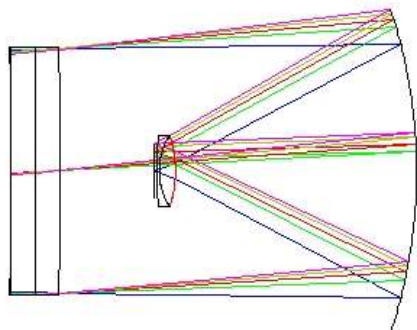
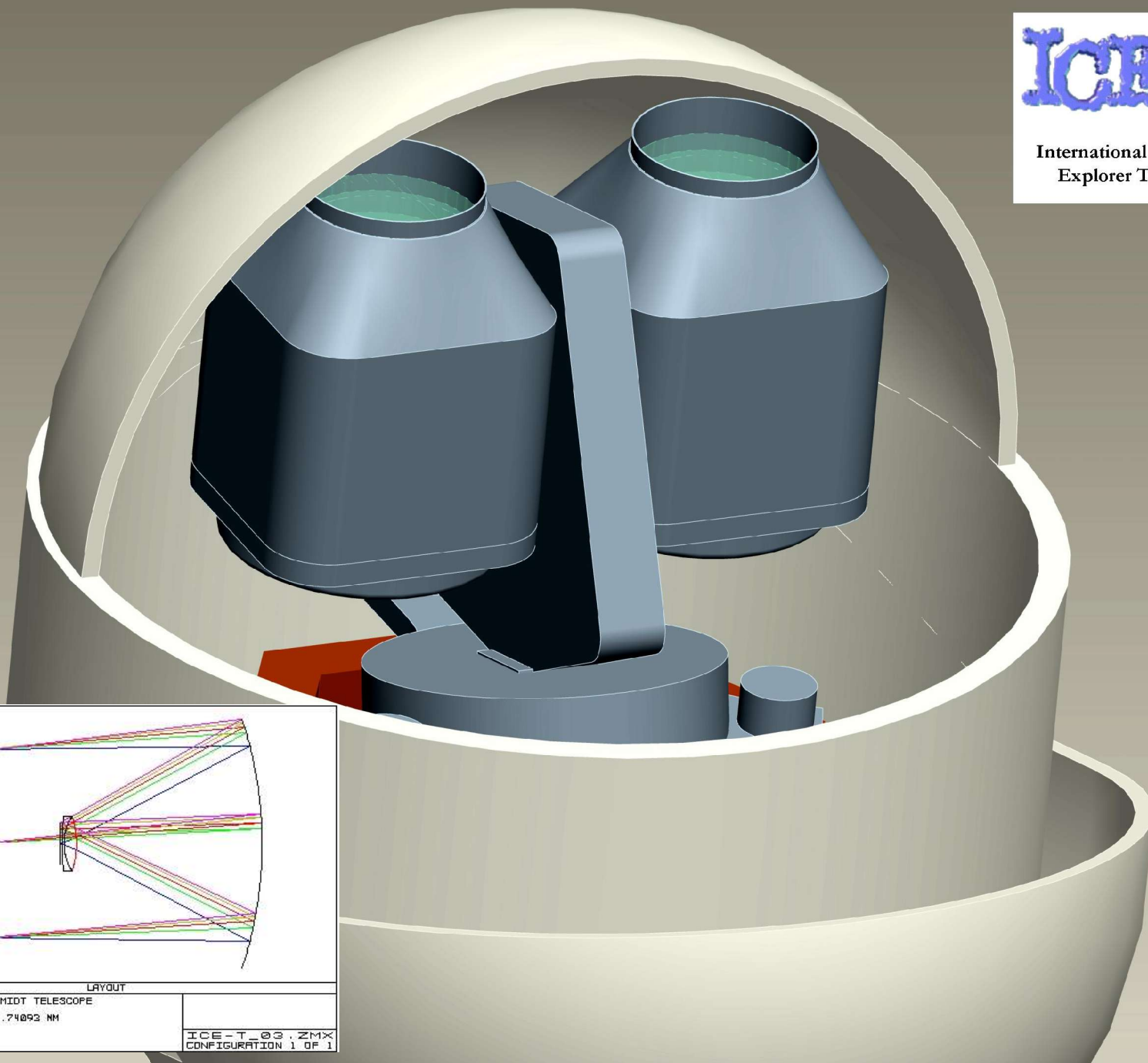
- **Scintillation contribution proportional to h of the turbulent layer (layer at 5 km contributes 30x more than layer at 150 m Dome C)**

- Two parallel-mounted 60/80cm very fast f/1 Schmidt telescopes
- Each with single-filter photometer and two monolithic 10.3k x 10.3k thinned 9-micron CCDs
- Total field of view would be 12° diameter of which 77 % would be seen by the CCDs (8.8° x 8.8°)
- Image scale: 3.0 "/pix
- First light for ICE-T may be achieved in winter 2010 or 2011



ICET

International Concordia
Explorer Telescope



LAYOUT

F/1 ACHROMATIC SCHMIDT TELESCOPE
WED JUL 20 2005
TOTAL LENGTH: 1005.74093 MM

ICE-T_03.ZMX
CONFIGURATION 1 OF 1



National Principal Investigators

- **Klaus G. Strassmeier**, AIP, Potsdam, Germany (P.I.)
- **Giuseppe Cutispoto**, INAF-Catania, Catania, Italy
- **N.N.**, France (tbd)
- **Ignasi Ribas**, IEEC, Barcelona, Spain
- **Michael Ashley**, University of New South Wales, Sydney, Australia

Scientific and technical partner teams

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- **Alfred-Wegener Institute for Polar Research (AWI), Bremerhaven & Potsdam, Germany:**
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