

ESO's Role in Ground-Based Observations of NEOs

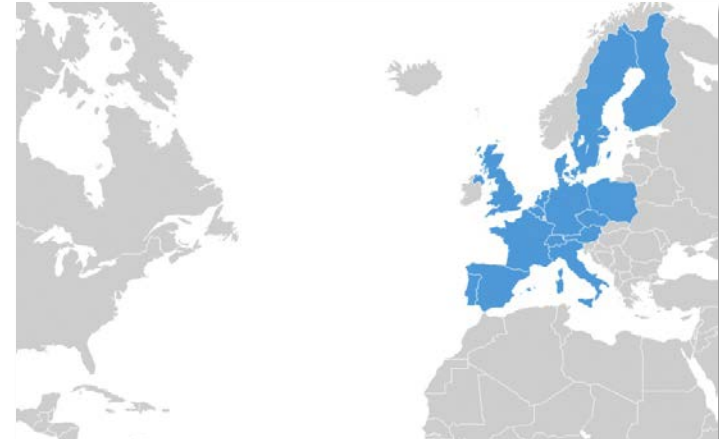
Andrew Williams

3 Feb 2017



European Southern Observatory

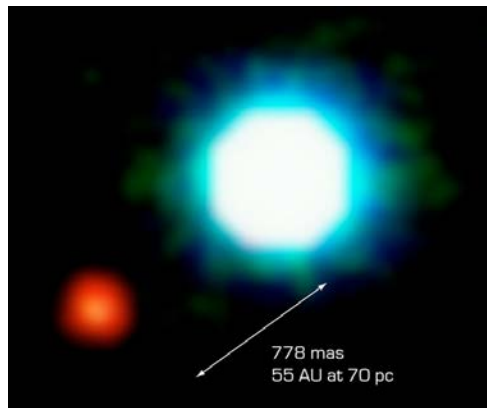
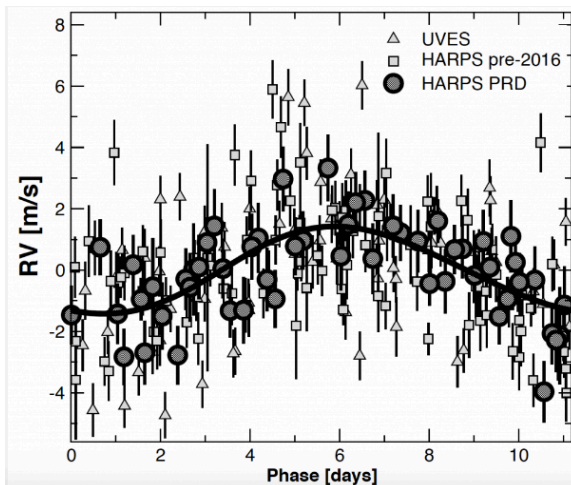
- European Organisation for Astronomical Research in the Southern Hemisphere
- 15 (+1) Member States
- Intergovernmental Treaty
- Observatories located in Atacama desert, Chile
- HQ in Germany
- Office in Santiago



ESO Mission

The Governments of the States parties to this convention [...] desirous of jointly creating an observatory equipped with powerful instruments in the Southern Hemisphere and accordingly promoting and organising co-operation in astronomical research [...]

From the preamble to the ESO Convention, 1962



ESO's Role in NEO Monitoring

■ ESA-ESO Agreement

- VLT observes all NEOs with
 - High-risk (Palermo Scale > -5)
 - Faint magnitude ($V > 23$)

➔ Refine the orbit

- Up to 22h/year

■ Director-General's discretionary time:

- For significant hazard event or collision orbit, full ESO resources will be deployed for a complete characterization of the impactor:
 - Size, shape, composition, possibly mass and density, ...

■ 2015 Signatory to IAWN

Paranal and the Very Large Telescope (VLT)
2600m altitude

VLT

- 8.2-m Main Mirror x 4
- ~50 milliarcsecond angular resolution
- Optical – mid-IR
- Operates as
 - Interferometric array or
 - Individual units

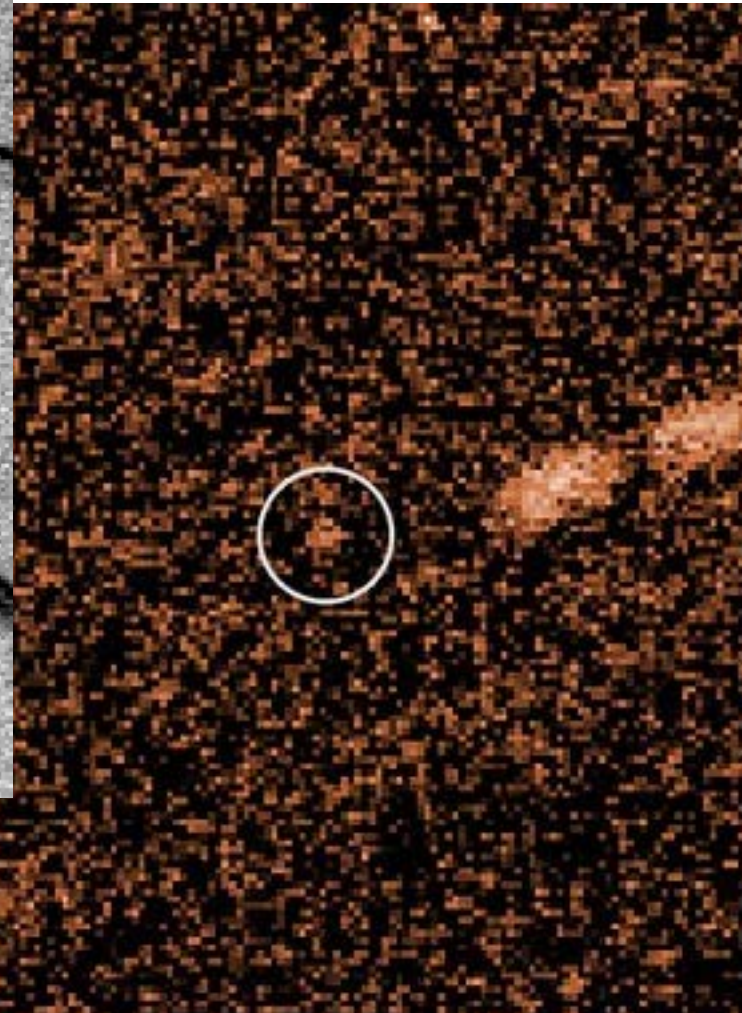
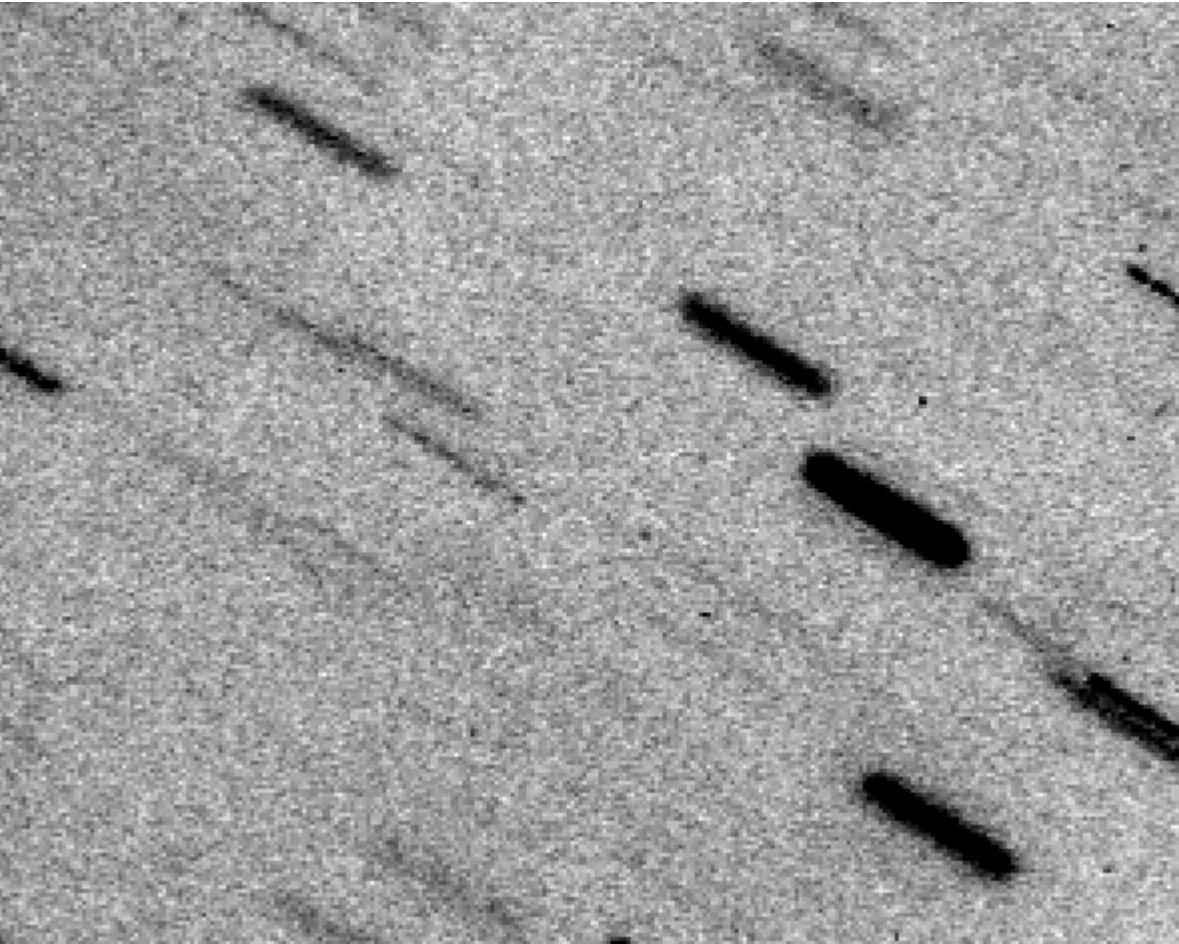




Object	Obs.date	PS before	PS after	Comment	Object	Obs.date	PS before	PS after	Comment
2009 FD	2013-Nov-30	-1.8	-2.60	Recovered	2014 WP362	2015-Mar-23	-5.31		
2013 YC	2014-Jan-22	-2.9	-inf	Extended	"	2015-Apr-08		-inf	Extended
2014 AF16	2014-Mar-11	-2.4			2015 DD54	2015-Mar-30	-6.66	-6.60	Extended
"	2014-Apr-01		-inf	Extended	2014 WP362	2015-Apr-10	-7	-inf	Extended
2014 DN112	2014-Mar-28	-3.1	-3.60	Extended	2008 LG2	2015-Jun-15	-6.13		
2014 EU	2014-Mar-28	-6.6	-6.60	Extended	"	2015-Jul-07		-inf	Recovered
2013 YD48	2014-Apr-09	-3.5	-4.80	Extended	2015 KP18	2015-Jun-16	-3.79	-7.30	Extended
2012 HP13	2014-Apr-09	-6.6	-inf	Recovered	2003 LN6	2015-Jun-26			Observations failed
2014 DN112	2014-May-01	-3.6	-inf	Extended	2000 UK11	2015-Aug-25	-5.62		Recovered
2014 GY44	2014-May-01	-9.2	-6.70		"	2015-Aug-28			
"	2014-May-28	-6.7	-6.40	Extended	"	2015-Sep-11		-inf	
2014 FX32	2014-May-01	-5.4	-5.40		2015 PL57	2015-Sep-09	-5.17		
"	2014-May-28	-5.4	-5.10	Extended	"	2015-Oct-13		-9.14	Extended
2014 HM129	2014-May-22	-4.2	-inf	Extended	2005 VN5	2015-Sep-18	-5.69		Not found
2014 HM187	2014-May-28	-4.5	-inf	Extended	2015 SG	2015-Oct-15	-5.3	-8.58	Extended
2012 VU76	2014-May-28	-6.1			2015 KP18	2015-Dec-12	-3.8	-7.30	Extended
"	2014-Jun-15		-inf	Recovered	2006 XP4	2015-Dec-13	-7.34	-inf	Recovered; confirmed
2013 XK22	2014-May-28	-4.4			2015 VD2	2015-Dec-12	-5.3	-8.45	Extended
"	2014-Jun-15		-4.92	Extended	2006 QV89	2016-Feb-04	-3.81		Failed
2013 YD48	2014-Jun-15	-4.8	-inf	Extended	2008 EX5	2016-Feb-05	-4.55		Failed
2011 PU1	1900-Jan-05	-4.3	-inf		2013 GM3	2016-Jan-30	-5.32		Failed
2014 KS76	2014-Jun-15	-7.5	-8.28	Extended	2014 JU15	2016-Feb-14	-4.99		Failed
2014 LJ	2014-Jun-15	-7.8	-7.90	Extended	2016 E156	2016-Mar-17	-6.69	-6.73	Extended
2014 WF6	2014-Dec-17	-5.07	-3.99		2015 GM3	2016-Apr-01	-5.32		Failed
"	2015-Jan-15	-3.99	-7.20	Extended	2014 JU15	2016-Apr-11	-4.99		Failed
2014 WA201	2014-Dec-17	-5.71	-4.94	Extended	2016 EP84	2016-Apr-11	-5.52	-8.54	Extended
2014 OO6	2014-Dec-17	-3.91	-6.37	Extended	"	2016-Jul-16	-4.42	-inf	Extended
2014 XL7	2015-Jan-15	-3.1	-inf	Extended	2016 LX48	2016-Jul-16	-4.42	-inf	Extended
2003 LN6	2015-Jan-23	-5.22			2016 JB18	2016-Jul-08	-5.52		Failed
"	2015-Feb-24		-5.22	Recovered	2016 BE	2016-Jan-26	-5.32		
					"	2016-Apr-12		-8.44	Extended
					2013 XK22		-4.49	-4.65	Recovered
					2016 FV13	2016-Sep-29	-5.59	-5.30	Extended
					2016 RX	2016-Sep-27	-6.71	-inf	Extended
					2016 SK2	2016-Oct-27	-4.71	-7.19	Extended
					2016 SJ35	2016-Nov-10	-5.16	-inf	Extended



VLT Observations



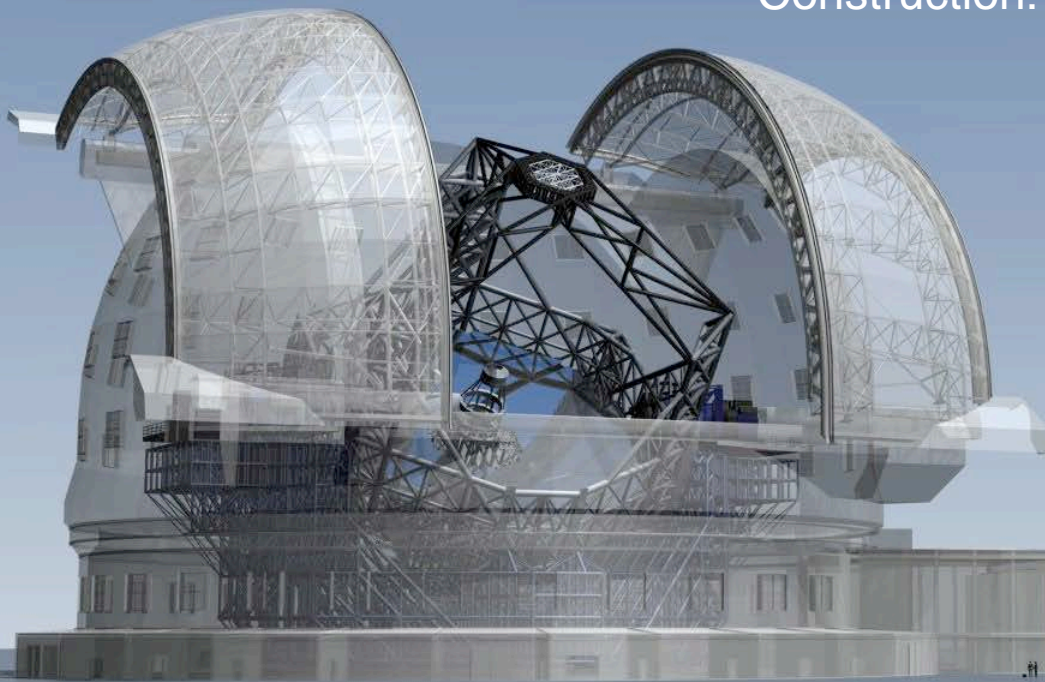
Extremely Large Telescope

Largest optical/infrared telescope in the world

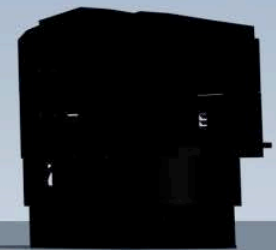
39m segmented primary mirror

On Armazones, as integral part of Paranal

Construction: on-track for first light in 2024



VLT 8-metre mirror





The ESO Extremely Large Telescope on Armazones
Altitude: 3060 metres



Conclusions

- VLT is very successful at tracking and assessing the threat of faint NEOs
- VLT provides a niche support to large surveys
- Both ground-based and space-based capabilities are needed
- The role of archive data
- International collaboration