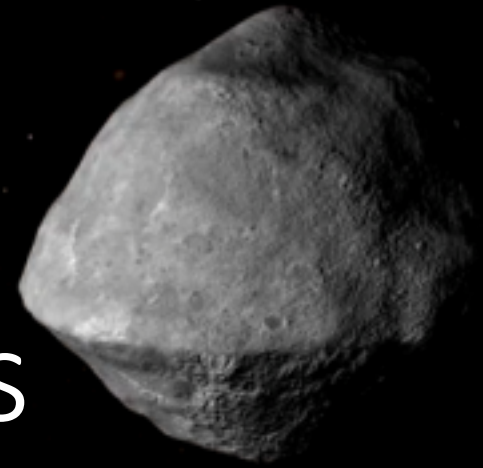
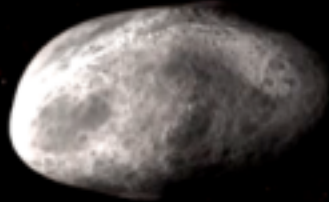




EXCELENCIA
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OCHOA



Hera Mission WG 2: Remote Observations Future plans



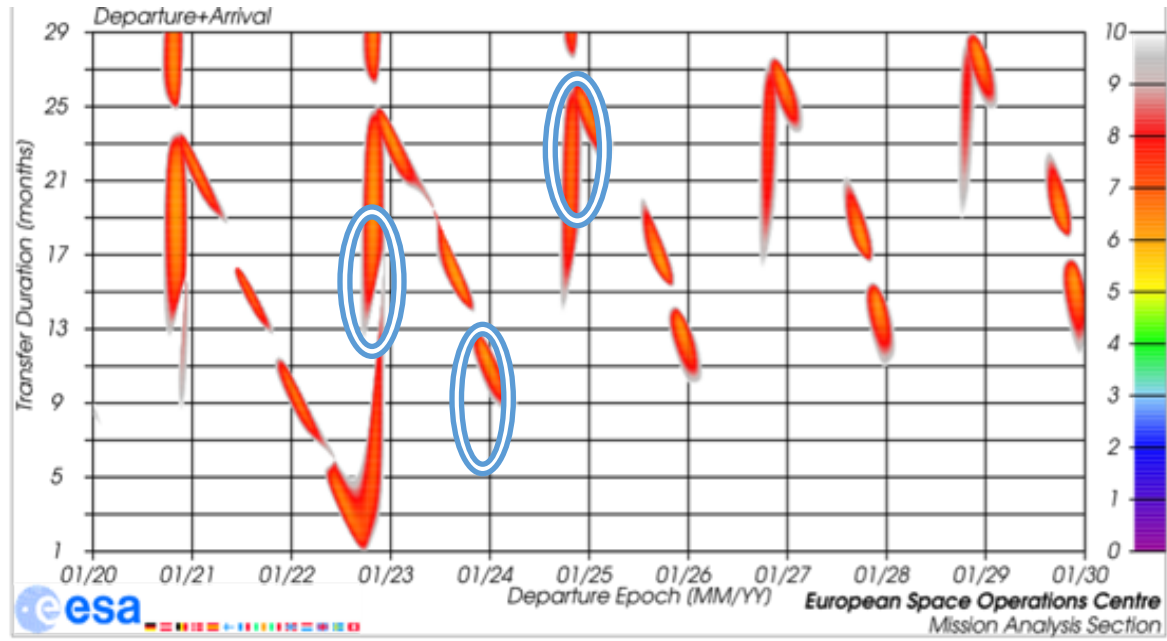
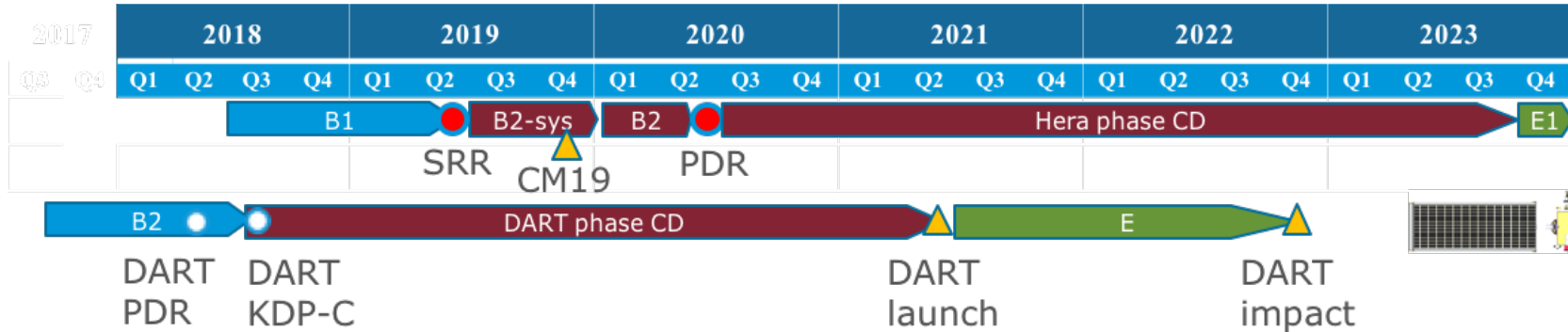
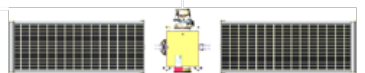
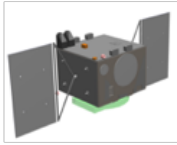
J. de León

Instituto de Astrofísica de Canarias – IAC (Tenerife, Spain)

and the Hera WG 2 Team

*Hera Community Workshop
15-16 November, 2018. Berlin*

Hera mission – launch



- Departure date: **2022/10/20**
 Earth swing-by: no
 Arrival date: 2024/6/10
 Delta-V: 1.240 km/s
- Departure date: **2023/10/22**
 Earth swing-by: 2024/10/26
 Arrival date: 2026/09/02
 Delta-V: 1.405 km/s
- Departure date: **2024/10/14**
 Earth swing-by: N/A
 Arrival date: 2026/7/13
 Delta-V: 1.514 km/s

"Orange" areas correspond to candidate launch opportunities, later dates imply increasing Earth distance

Hera mission – WG 2

1. Baseline target: binary asteroid Didymos



Parameter	Value
Diameter of Primary D_p	0.780 km \pm 10%
Diameter of Secondary D_s	0.163 \pm 0.018 km
Bulk density of the primary ρ_p	2104 kg m ⁻³ \pm 30%
Distance between the centre of primary and secondary (a_{orb})	1.18 km +0.04/-0.02 km
Total mass of system	5.278 \pm 0.54 x 10 ¹¹ kg
Rotation period of the primary	2.2593 \pm 0.0008 h

2. Potential flyby targets

	A	B	C	D	E
1	Asteroid #	Asteroid Name	Min. Distance [AU]	Encounter Date	Mag.
2	1126	Otero	0.0154	18/5/25	11.9
3	2121	Sevastopol	0.0361	28/8/25	12.3
4	2322	Kitt Peak	0.0413	1/1/26	13.2
5	2584	Turkmenia	0.0365	14/5/26	13.1
6	3456	Etiennemarey	0.0136	1/5/26	13.7
7	3818	Gorlitsa	0.0253	5/5/26	14.1
8	4954	Eric	0.0323	3/6/25	12.6
9	6108	Glebov	0.0362	8/7/26	14.2
10	6851	Chianti	0.0494	16/8/25	14.4
11	8959	Oenanthe	0.0497	7/7/26	14.9
12	9514	Deineka	0.0154	9/7/26	14.6
13	10278	1981 EW30	0.0283	17/3/26	15.1
14	10858	1995 FT	0.0346	10/7/25	14.1

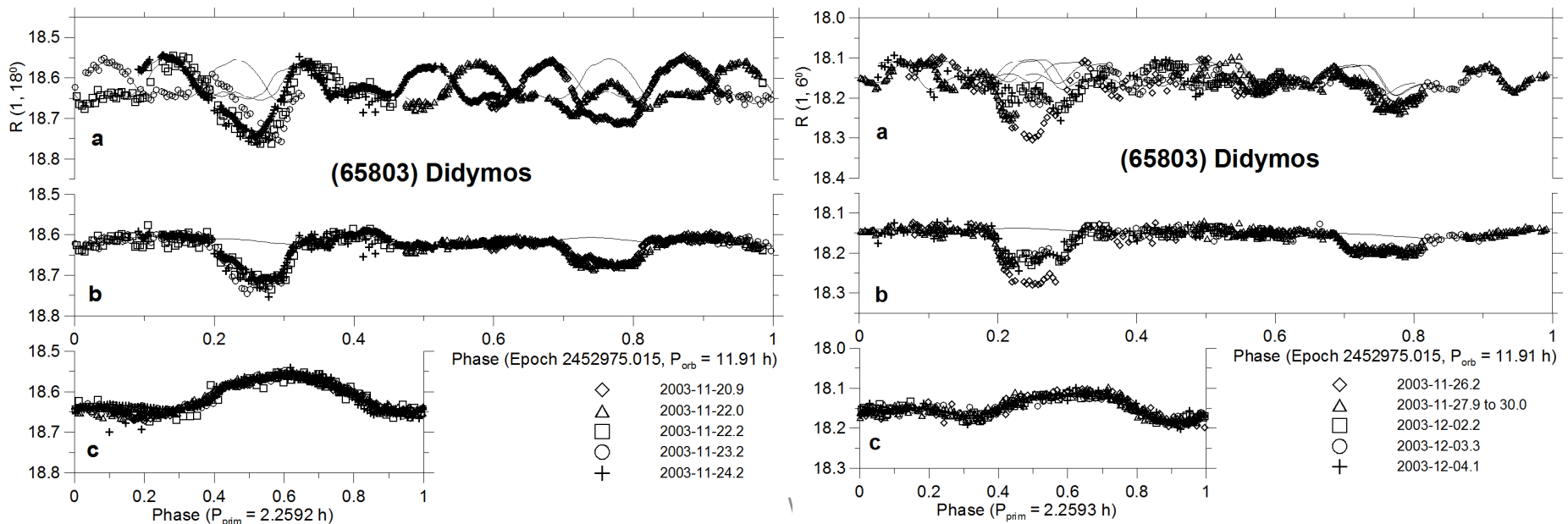
WG 2: Didymos

Objective 1: Establishing a synchronous secondary rotation and a_s/b_s

The highest quality data (rms residuals 0.008 mag) obtained during 2003-11-20 to -12-04 suggest a low secondary amplitude of ~ 0.02 mag outside events. But the few features might be small systematic errors in the observations.

We need to confirm it, deriving P_s and estimating a_s/b_s , with high quality observations (errors < 0.008 mag) in next apparition(s). Two full nights with a 8-10m telescope around the Didymos' opposition in March 2019 ($V \sim 19.8$) or in February 2021 ($V \sim 18.9$) will be needed.

Taken from Pravec's presentation at Didymos Observer Workshop, Prague 2018



WG 2: Didymos

Objective 1: Establishing a synchronous secondary rotation and a_s/b_s

Objective 2: *Gathering data for a future determination of orbit change by BYORP*

Didymos apparition in 2019:

- L1= 28 January -12 February (new moon 4 February) $V \sim 20.5$
- L2= 26 February -13 March (new moon 6 March) $V \sim 19.8$
- L3= 28 March - 12 April (new moon 5 April) $V \sim 20.7$

Proposals submitted - Hera

- **2 N @ 10.4m GTC** (La Palma). IP: de León (L2 - March). OSIRIS - Sloan r'
- **2x0.5 N @ 8.2m VLT** (Chile). IP: Carry (L3 - April). FORS2 - R

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Proposals submitted - DART

- **2.5 N @ 8.2m Keck** (Hawaii). IP: Andrew Rivkin (0.5 N L1, 1 N each L2, L3). LRIS-ADC, Sloan r'
- **14.2 h @ 8m Gemini N / 10.2 h @ Gemini S** (Chile) IP: Thomas (L2)
- **0.5 N @ 8.4m LBT** (Arizona). IP: Howell (L2). LBC Blue, Bessel V + LBC Red, Bessel R
- **3x0.5 N @ 6.5m MMT** (Arizona). IP: Howell (L2). MMTCam, Sloan r'

WG 2: Fly-by targets

Main criteria:

- Binary asteroid
- Not an S-type
- Fresh asteroid surface

- See talk by Pravec & Green (Session 3, 12:30) and discussion
- See talk by Rozitis about Cuyo (Session 5, 16:30)

Proposals submitted

- **5N @ 8.2m VLT/3.6m NTT** (Chile) IP: Fitzsimmons/Green (April 2019)
Rotationally Resolved Spectroscopy
 - 1N with X-SHOOTER @ VLT: **Didymos**, (1917) Cuyo, and (25021) Nischaykumar
 - 4N with EFOSC/SOFI @ NTT: (2121) Sevastopol
- **4N @ 4.2m WHT** (La Palma) IP: Fitzsimmons (March 2019)
Rotationally Resolved Spectroscopy + Photometry (lightcurve)
 - Visible spectra with ACAM of **Didymos**
 - Visible spectra + light curve with ACAM (Sloan r') of (1917) Cuyo
 - Near-infrared spectra with LIRIS of (2121) Sevastopol
- **20 h @ 10.4m GTC** (La Palma) IP: de León (March – August 2019) Visible spectroscopy with OSIRIS of potential spacecraft targets (Band C proposal, “filler”)