

EREBUS: the EuROpean Extinction BUmp Survey



S. Latzko, A. Postel*, M. Cui, M. Bartylak, L. Capitanio, B. Engegaard, M. Gassner, S. Heinemann, G. Kargl, P. G. Madonia, A.J. May, J. Rodriguez Munoz, G.J. Schwarzkopf, R.F. Shipman, R. Skolidis, V. Trivino Herrero, K. Wikman

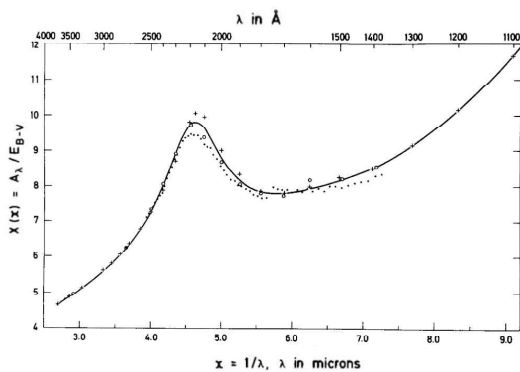
*andreas.postel@unige.ch

Scientific motivation

Recent observations by *Planck* [1] have shown diffuse large scale dust structures in the Milky Way uncorrelated with stellar structures, the origin of which is not well understood.

In order to better understand the distribution and time evolving behaviour of dust in the ISM, it is proposed to survey UV extinction in the Milky way and Local Group of galaxies.

The so-called *UV bump* is a specific extinction feature in the far-UV, previously observed by the *IUE* and *FUSE* observatories [2,3].



A number of lab-based experiments strongly suggest carbonate grains to be the carrier of this feature [4], which are understood to be crucial to the evolution of star formation regions.

Observations with EREBUS

EREBUS will map this feature in 3D within the Milky Way using data from *Gaia* [5] and in 2D in the Local Group galaxies.

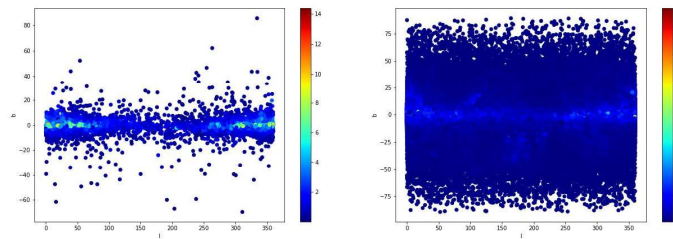
A hierarchical map will be built up iteratively; three classes of targets:

Class I: Brightest stars, O-B3. Concentrated in Galactic plane. Star forming regions. From SIMBAD catalog: 5115 possible targets.

Class II: B4-A stars. From SIMBAD catalog: 6026 possible targets.

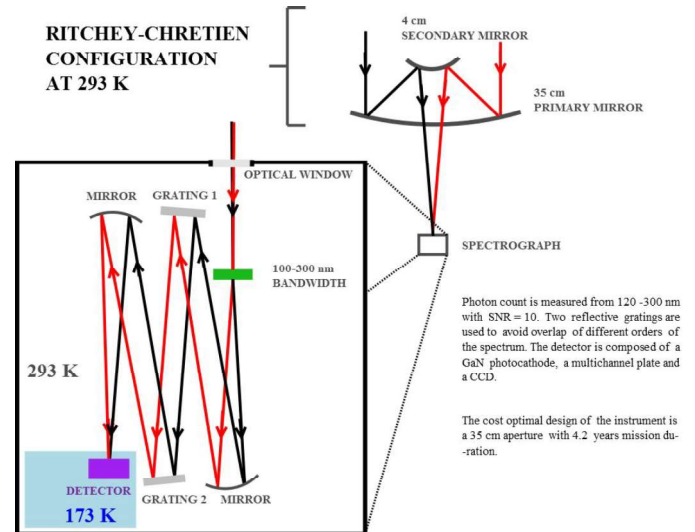
Class III: Local Group galaxies; from MESSIER: 54 possible targets

By comparing spectroscopic observations with photosphere models at distances determined by *Gaia*, the extinction curve can be determined.



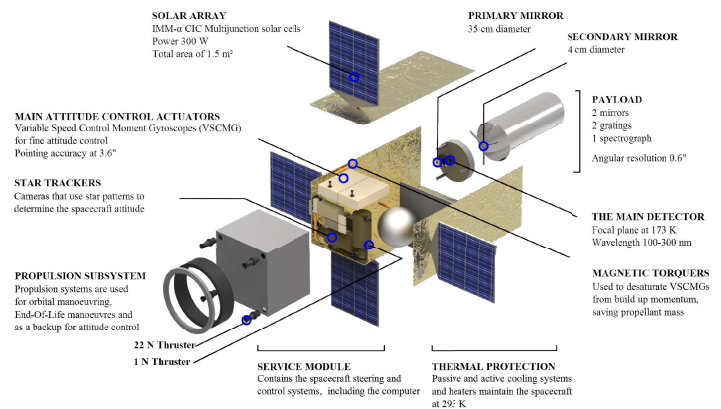
Distribution in Galactic coordinates of stars with effective temperature of 30000 K (left) and 7500 K (right), from the *Gaia* Universe Model Snapshot (colours indicate the estimated A_V)

Instrument design



Spacecraft design

In order to support UV observations, a spacecraft architecture is proposed for deployment to a Sun-Synchronous Low Earth Orbit.



References

- [1] Planck Collab. *Astronomy & Astrophysics* 571 (2014)
- [2] Fitzpatrick and Massa. *The Astrophysical Journal* 307 (1986)
- [3] Sofia, et al. *The Astrophysical Journal* 625.1 (2005)
- [4] Gavilan, et al. *Astronomy & Astrophysics* 607 (2017)
- [5] Prusti, et al. *Astronomy & Astrophysics* 595 (2016)

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