

Gaia Successor with International Participation

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Abstract: Astrometric data from the current Gaia are already revolutionizing astronomy in all branches from the solar system and stellar structure to cosmic distances and the dynamics of the Milky Way. In April 2018, the second data release based on 22 months of observations gave 5-parameter astrometry for more than 1.3 billion sources while subsequent releases will give increasingly accurate and comprehensive sets of astrophysical data. The final Gaia data set will presumably be based on 8-10 years of observations thus providing a new astrometric foundation of all astronomy. It is however clear that a Gaia successor in twenty years for observation of the same stars is required in order to maintain and strengthen the astrometric foundation of astronomy. The two missions together will provide motions with 10-20 times better accuracy than Gaia alone for the observed objects, be it stars in the Halo or in galaxies or objects in our solar system or binary stars with sub-stellar components etc.

Gaia operates in optical wavelengths, and thus it is blind to several physical processes taking place within obscured regions of the Milky Way. A mission in NIR (at a bandpass of 400-1800 nm), however, would be able to unravel these processes, and would also multiply the number of observed objects by a factor about ~ 2.5 down to $G=21$ mag. This is the factor for the whole sky while a further factor 2 is expected in the Galactic region ($b=\pm 10$ deg). In 2017 ESA studied such a NIR space observatory (GaiaNIR). The outcome was that it requires new types of NIR Time Delay Integration (TDI) detectors to scan the entire sky and to measure global absolute parallaxes. The ESA study also hinted that a US-European collaboration would be the optimal answer to make GaiaNIR science and technology a reality. We have therefore in March together with US colleagues submitted a proposal, available at <http://www.astro.ku.dk/~erik/xx/WhitePaperNIRSpaceAstrometry.pdf>, for such a study in the US Decadal Survey.

Gaia is an ESA-only mission as Hipparcos was and we thought a Gaia successor should be the same. Recently however, we have realized the importance of strengthening our efforts by international collaboration. This has begun by involving the USA and it appears there is considerable interest also in Japan.