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STRATOSPHERIC BALLOONS AS A PLATFORM FOR THE NEXT LARGE FAR INFRARED OBSERVATORY

Abstract

Observations that require large physical instrument dimensions and/or a considerable amount of cryogens, as it is the case for high spatial resolution far infrared astronomy, currently still face technological limits for their execution from space. Due to these limits, the far infrared domain in particular is lacking behind other wavelength regimes in terms of angular resolution and available observational capabilities, especially after the retirement of the Herschel Space Observatory. Balloon-based platforms promise to complement the existing observational capabilities by offering means to deploy comparably large telescopes with comparably little effort, including other advantages such as the possibility to regularly refill cryogens and to change and/or update instruments. The planned European Stratospheric Balloon Observatory (ESBO), currently under preparation by a consortium of European research institutes and industry, aims at providing these additional large aperture far infrared capabilities, exceeding the spatial resolution of Herschel, in the long term. In particular, the plans focus on reusable platforms performing regular flights and an operations concept that provides researchers with proposal-based access to observations as also practiced on space-based observatories. It thereby aims at offering a complement to other airborne, ground-based, and space-based observatories in terms of access to wavelength regimes, spatial resolution capability, and photometric stability. In order to fully exploit the potential offered by regularly flying balloon platforms, ESBO foresees the option to exchange instruments and telescopes in between flights. While the far infrared capabilities are a main long-term objective, ESBO will offer benefits in other wavelength regimes along the way. Within the recently launched ESBO Design Study (ESBO DS), financed within the European Union's Horizon 2020 Programme, a prototype platform carrying a 0.5 m aperture telescope for UV and visible light observations is being built and a platform concept for a next-generation far infrared telescope is being studied. A flight of the UV/visible prototype platform is currently foreseen for 2021. The paper at hand will outline the scientific and technical motivation for a large aperture balloon-based far infrared observatory and the ESBO DS approach towards such an infrastructure. Secondly, the paper will present the technical motivation, science case, and instrumentation of the 0.5 m UV/visible platform.