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High-Altitude Pseudo-Satellites – An Emerging Tool in support of Earth Observation Satellite Development, Calibration/Validation and Applications

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High-Altitude Pseudo-Satellites (HAPS) are unmanned airborne platforms in the lower stratosphere at 20 km altitude or higher allowing station keeping above a fixed location or area for extended periods. HAPS have the potential to provide observation capabilities bridging the gap between satellite and ground based observations, including aircraft. A number of industrial HAPS developments for both airplanes (heavier-than-air) and airships (lighter-than-air) are ongoing and first promising results have been achieved with more expected in the coming years. HAPS payload capacities are quite diverse depending on the technology chosen and range from 5 kg to 250 kg. Miniaturized Earth observation instruments, e.g., for microsatellites, have been proposed and partially demonstrated for various applications comply with the weight and power requirements of HAPS.

To discuss the potential of HAPS in the frame of satellite mission development, calibration/validation and applications the European Space Agency (ESA) has organized the HAPS4ESA symposium in October 2017. It brought together HAPS platform developers, payload providers, science communities, service and application industry and European organizations to review and document the current state-of-the-art in HAPS developments for the first time in Europe. The goal was to provide feedback and recommendations to ESA regarding future initiatives and programmatic needs for Earth Observation, Telecommunication and Navigation programmes.

The Earth observation science community has shown a particular interest in the exploitation of this emerging technology. Proposed applications and scientific fields range from security, disaster response and management, and maritime surveillance to precision farming, air quality, urban planning, sea ice and green house gas emission monitoring using instruments covering basically all Earth observation instrument types from μ-wave, including SAR and GNSS-R, to optical, including hyperspectral. Based on the results of the workshop, discussions with stakeholders and first project results, ESA will define its HAPS roadmap, acknowledging the complementarity between satellites and HAPS and the potential of HAPS to enhance and accelerate the satellite development life-cycle.

The paper will provide a short overview on HAPS technologies, describe how HAPS could contribute to Earth
Observation activities, and outline the potential of HAPS to provide general support the EO science community as a whole.