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THE JUICE MISSION AND THE FUTURE EXPLORATION OF THE ICY GALILEAN SATELLITES: COMPLEMENTARITIES AND SYNERGIES IN VISIBLE AND NEAR-INFRARED REMOTE SENSING

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The Jupiter Icy Moons Explorer (JUICE) mission, whose launch is currently scheduled in 2022, is the first ESA-led mission devoted to explore the Jupiter system with an emphasis on the icy Galilean satellites Europa, Ganymede and Callisto. JUICE will indeed be the first spacecraft ever to enter orbit around an icy satellite, Ganymede, allowing an unprecedented analysis of its surface, interior and tenuous atmosphere. Among the remote sensing instruments onboard JUICE are a multispectral camera (JANUS) equipped with 13 filters covering the spectral range 0.34-1.08 µm, and an imaging spectrometer (MAJIS) whose sensitivity covers the overall spectral range 0.5-5.54 µm.
Once in orbit around Ganymede at 5000-km altitude (GCO-5000 phase), JANUS is committed to achieve global coverage in 4 filters at a resolution better than 400 m/px, but it can reach the maximum achievable resolution of 75 m/px where necessary. In this phase, MAJIS shall achieve global coverage at spatial resolution between 2 and 5 km/px.
In the following orbital phase carried out at 500-km altitude (GCO-500 phase), the actual color coverage will depend on the available data volume, but in principle it may be planned to observe specific regions of interest at the maximum achievable spatial resolution with both JANUS (7.5 m/px), also using contiguous color filters, and MAJIS (75 m/px).
The joint analysis of multispectral and hyperspectral datasets of past or ongoing planetary space missions permitted to achieve better scientific results than those obtainable from the individual analysis of these two kind of datasets. For instance, the correlation between the photointerpretation obtained at a high spatial resolution and the identification of spectrally homogeneous regions at lower spatial resolution, in principle would allow an extrapolation of hyperspectral data at spatial resolutions inaccessible to MAJIS in the spectral region 0.5-1.0 µm where JANUS and MAJIS overlap each other.
Here we describe the main complementarities and synergies that could be planned in the future, regarding the exploration of the icy Galilean satellites - most notably Ganymede - thanks to the combination of JANUS and MAJIS data. Moreover, we suggest further synergies potentially achievable through the integration of data sets from additional instruments. In doing this, we take into account the operational constraints imposed by the technical characteristics of the spacecraft during the different phases of the JUICE mission.