

Small and Large Satellites – Joint Operations in Earth Observation

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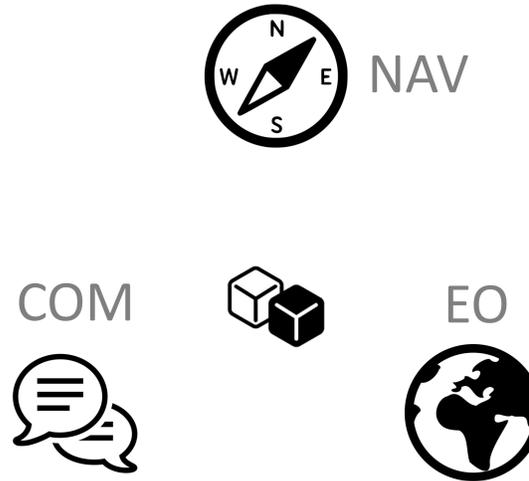
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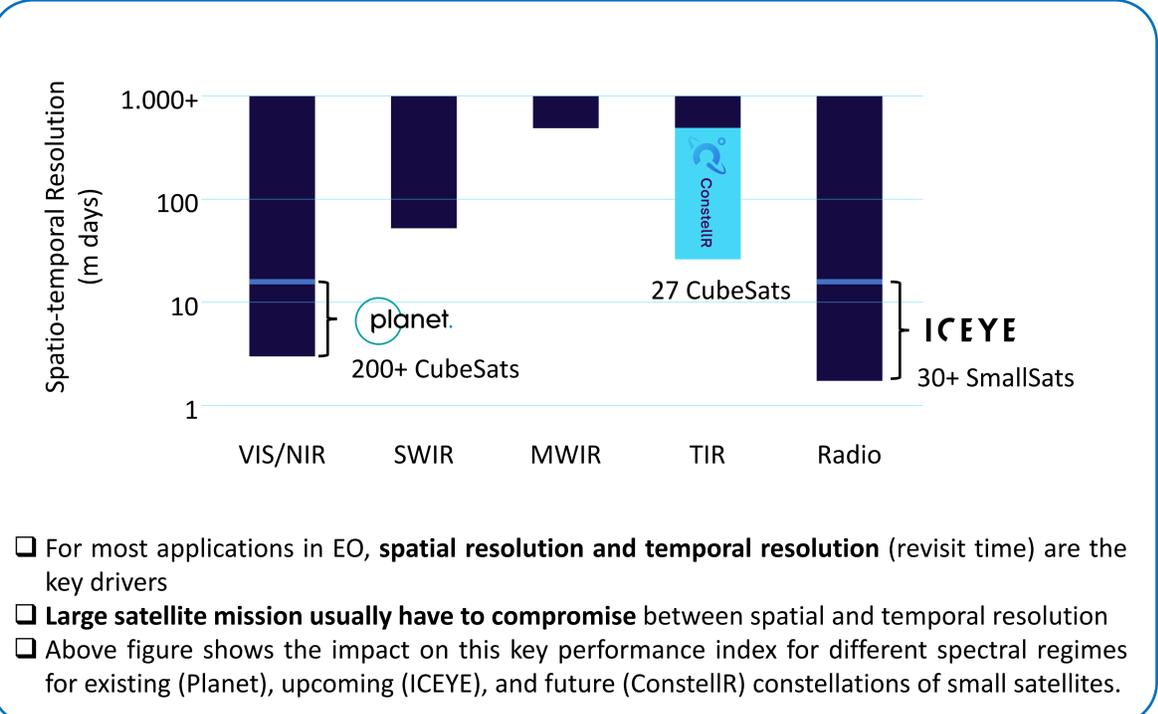
Motivation

While projects for the exploration of space remain ambitious and financially as well as technologically demanding projects, their benefit in understanding our planet is unrivaled [1]. On top of enabling technologies that keep drastically altering the way we communicate, navigate, or build our cities, they currently present the **only means of assessing key environmental variables on a global scale** [2]–[5].

Today, we witness the New Space era with promises of ever easier, faster, and cheaper space access as a major driving force for the future development of our space capabilities, specifically in Earth Observation (EO), but also in communication (COM) and navigation (NAV) applications. Since from an economic point of view, only now it became possible to **achieve resolution and coverage matching the needs of many applications outside the scientific community** by means of small satellite constellations [6]–[9].

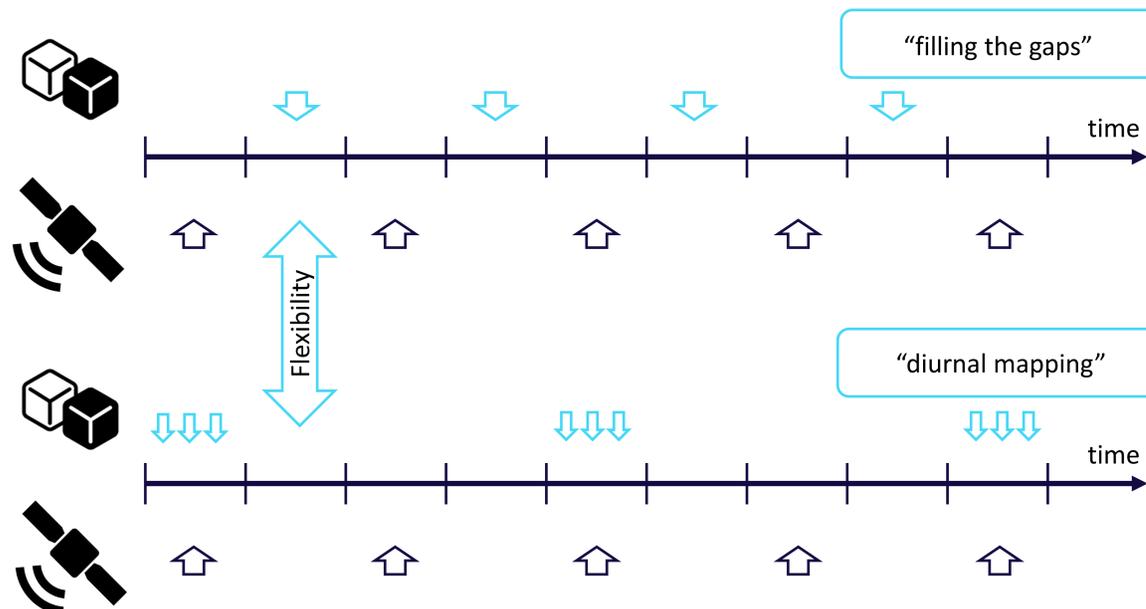


Small Sat Constellations in EO



Small AND Big instead of Small VS Big

- Small satellites are not going to replace large systems and vice versa in the near future.
- Working cooperatively can drastically cut the costs and increase performance.
- Figure below illustrates two interchangeable modes of common operations:
 - “filling the gaps” uses small sat constellations to close coverage gaps in large satellite missions
 - “diurnal mapping” uses small sat constellations to add diurnal mapping to large missions



Requirements

- To enable **effective cooperation between large and small missions** in EO, the following requirements must be met
 - Data interoperability: Development of methods to make data from different missions **intercompatible**
 - Spatial **homogenization** (georeferencing, tiling, resolution, etc.)
 - Spectral homogenization (central wavelength, band width, etc.)
 - Algorithmic homogenization (atmospheric correction, etc.)
 - Data visibility: Creating of **unifying data gateways** to access data in a standardized way
 - Data access: Single source for multiple providers
 - Data availability: Open APIs and include **missions outside the nearby ecosystem** (i.e., from KARI, ISRO, etc.). Establish effective **forecasting to make data ingestion plannable**

References

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