IAF EARTH OBSERVATION SYMPOSIUM (B1)
Earth Observation Societal and Economic Applications, Challenges and Benefits (5)

Author: Mr. Alexandre Corral
Alcimed, France

Mr. Steffen Harm
France
Ms. Elisabetta Lamboglia
European Space Agency (ESA-ESTEC), The Netherlands
Mr. Andrea Vena
European Space Agency (ESA), France

DEVELOPMENT OF A METHODOLOGY FOR QUANTIFYING DOWNSTREAM INDUCED AND AVOIDED GREEN HOUSE GASES FROM EARTH OBSERVATION MISSIONS: A CASE STUDY BASED ON VARIABLE RATE APPLICATION IN AGRICULTURE

Abstract

In light of the European Space Agency's (ESA) commitment to reducing greenhouse gas (GHG) emissions as part of its "Green Agenda," there is an urgent need to quantify the downstream carbon footprint resulting from its activities. While ESA has assessed its carbon footprint across Scope 1, 2, and 3 upstream emissions, a standardized methodology for evaluating Scope 3 downstream emissions is currently lacking. Such a methodology is essential for informed sustainability considerations in strategic decision-making.

Given the central role of ESA's Earth Observation programs, the development of a robust methodology to assess induced and avoided emissions stemming from space-based solutions becomes imperative.

This paper introduces an initial version of such a methodology, based on a specific case study: Variable Rate Applications (VRA) in agriculture, facilitated by Earth Observation missions. VRA methodologies directly impact GHG emissions by optimizing input volumes, primarily related to fertilizers and water. In this context, VRA serves as the "solution", while agriculture represents the "application" where this solution is used.

The resulting methodology comprises four key steps:

1. **Evaluate Earth Observation Program Emissions:** Assess the emissions associated with the satellite program(s) used for the solution (in this case study: VRA).
2. **Identify Other GHG Contributors:** Identify all other contributors to GHG emissions within the data pathway (including drones, data centers, and networks) related to the solution.
3. **Comparison of Current vs. Hypothetical Emissions:** Compare the current emissions of the application (agriculture) with the emissions that would occur if the solution (VRA) did not exist.
4. **Attribution to the Earth Observation mission study case:** Allocate a percentage of the result from step 3 to the Earth Observation study case.

This established methodology provides essential guidelines for evaluating the downstream impact of Earth Observation missions, contributing to informed environmental decision-making and sustainable practices. We conclude this article by outlining this methodology limitations, the still open points for future developments, as well as its adaptability to a wider range of applications.