

# The Biomass satellite mission

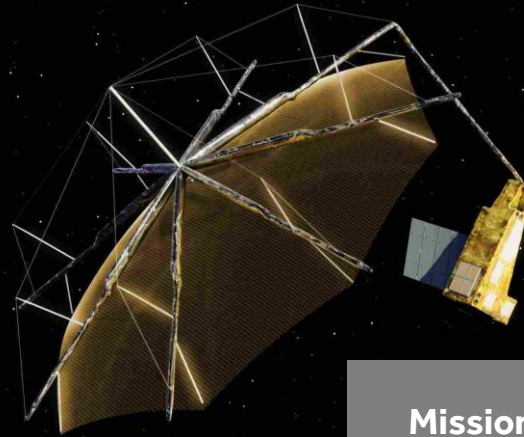
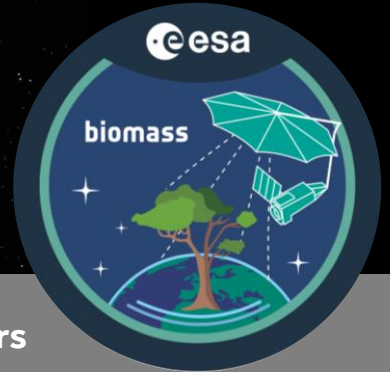


Image credit: ESA



The Biomass satellite will be the first to monitor the world's forests in 3D using an innovative radar and reflector design. It will measure the amount of wood in branches, as well as tree trunks, reducing uncertainties in carbon stored in forests.

## Opportunities Biomass data will offer

The Biomass mission will increase the accuracy of estimates of carbon stored in forests, information essential for the global stocktake, which allows countries to observe their progress towards the Paris Agreement and report for the Global Stocktake.

Biomass will be the first satellite to carry a P-band Synthetic Aperture Radar (SAR), providing improved measurements of forest height and biomass. This includes boreal, tropical, temperate and mangrove forests, as well as plantations.

These data will also allow:

- Mapping of sub-surface geology;
- Measuring topography under dense vegetation;
- Estimating glacier and ice-sheet velocities.

Biomass will provide measurements of above ground biomass and canopy height at 200m resolution, and areas of forest clearing at 50m resolution.

## Mission Partners

- [European Space Agency](#)

## UK Expertise

Biomass is a UK-backed ESA mission and part of ESA's Earth Explorers programme.

- [Prof Shaun Quegan](#), of the [National Centre for Earth Observation \(NCEO\)](#) and the [University of Sheffield](#), is the lead scientist and conceived the mission concept in 2005 with [Dr Thuy Le Toan](#) of the [Centre d'Etudes Spatiales de la Biosphère \(CESBIO\)](#), Toulouse.
- [Airbus \(UK\)](#), the prime contractor, built the Biomass satellite in Stevenage, UK, finding innovative solutions to stay on track through the Covid-19 pandemic. The satellite has passed a comprehensive environmental test programme, replicating the conditions during launch and orbit.
- [Prof Mat Williams](#), of the [National Centre for Earth Observation \(NCEO\)](#) and the [University of Edinburgh](#), is a key member of the Biomass mission advisory group, bringing ecological, modelling and data assimilation expertise to the application of Biomass data.

"We're really proud that Airbus in the UK won the bid to be the prime contractor. This is the first time an ESA Earth Explorer mission has been both invented and built in the UK" – *Beth Greenaway, Chair of Space4Climate and the UK Space Agency's Head of Earth Observation and Climate*

## Mission Timeline

### Apr – May 2020

A digital solution enabled Airbus to continue development of the Biomass satellite through Covid, which finished late 2020.

### Jan 2021

Despite Covid-19 restrictions, Airbus completed the integration of hardware onto the structure model platform.

### Nov 2022

Biomass moved to Airbus's Astrolabe in Toulouse, France for final testing

### Feb 2023

Biomass passes mechanical tests

### 2025

Anticipated launch from Kourou, French Guiana on a Vega rocket.

## Instrumentation

Biomass will carry a fully polarimetric P-band Synthetic Aperture Radar (SAR) instrument to infer forest biomass and height. The huge antenna (12m across) will transmit a radar wave directed at Earth which will reflect the signal back to be measured by the spacecraft hardware. This will allow, for the first time, the creation of 3D tomographic images of forests worldwide. Biomass is now expected to be launched in 2025, into a polar, sun-synchronous orbit at 666km altitude. It will provide a global map of biomass every six months.

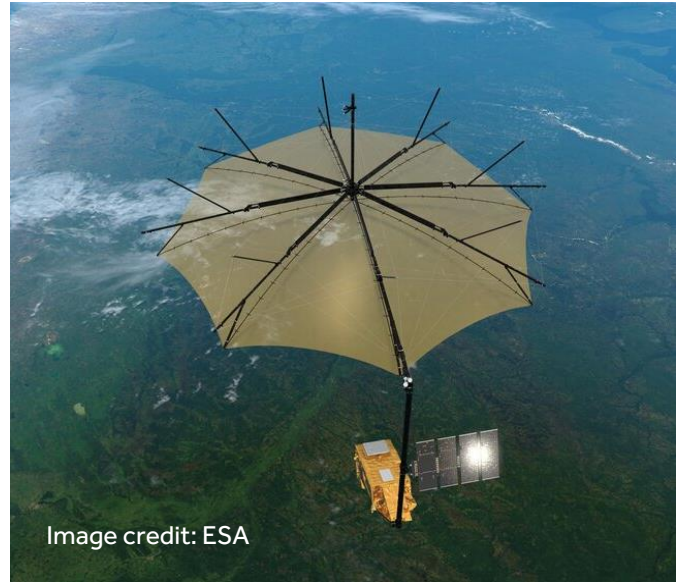


Image credit: ESA

## Further Information

- Airbus, Feb 2021: [Biomass forest sensing satellite shaping up.](#)
- Airbus, Sep 2021: [The Biomass satellite and disappearing...](#)
- Airbus, Nov 2022: [Bye-Bye Biomass: forest monitoring...](#)
- Arciono et al., 2014, doi: [10.1109/IGARSS.2014.6946700.](#)
- Arianespace, Oct 2019: [Arianespace and ESA announce...](#)
- [ESA: Biomass](#) [accessed 14<sup>th</sup> April 2023].
- ESA, Feb 2023: [ESAs forest satellite robust for launch.](#)
- Scipal et al., 2010, doi: [10.1109/IGARSS.2010.5648979.](#)
- Quegan et al., 2019, doi: [10.1016/j.rse.2019.03.032.](#)
- Quegan, 2022, doi: [10.1093/astrogeo/atac079.](#)

"The Biomass mission gives amazing opportunities to do things for the climate. This is the first mission of its type in space and will have a legacy of a decade or more"

– Prof Shaun Quegan, National Centre for Earth Observation and University of Sheffield, and UK Biomass Science Team Lead

Watch the Biomass video



Download this explainer