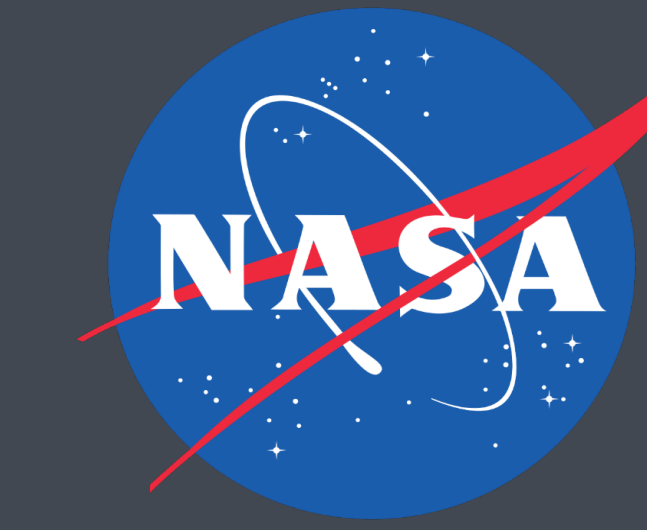


# Projection of Global Forest Carbon Sequestration Potential under Changing Climate

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## Science Questions

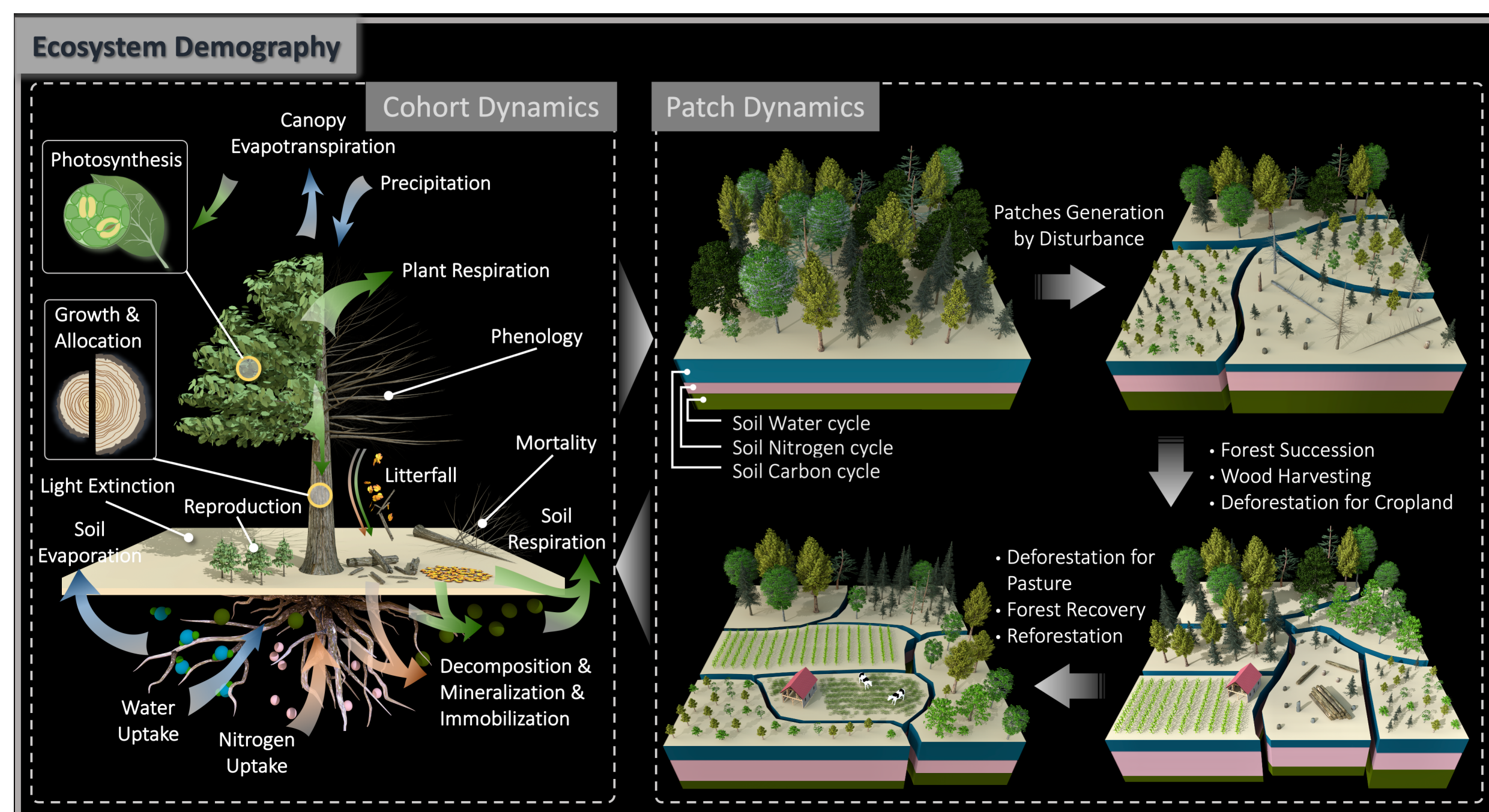
- What is the global forest carbon sequestration potential under a changing climate?
- What is the spatial heterogeneity of forest carbon sequestration?

## Data

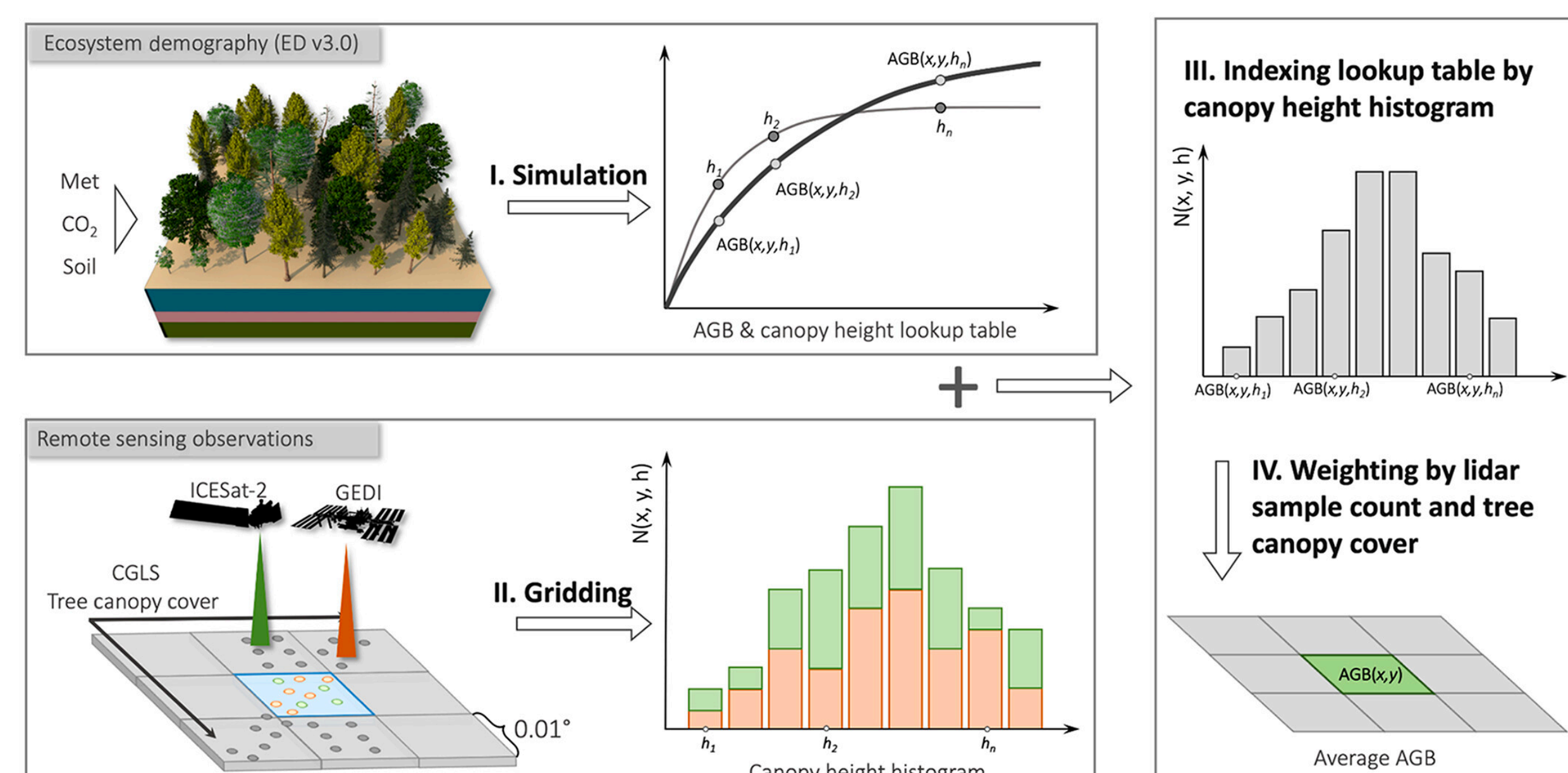
- Spaceborne lidar observations of canopy height from GEDI L2A and ICESat-2 ATL08
- Remote sensing based land cover fraction from ESA CGLS dataset
- Meteorology from NASA MERRA2
- Climate projections from four CMIP6 Earth System Models (ESMs) including GFDL\_ESM4, MPI\_ESM1, EC\_Earth3, and NASA\_GISS

## Method

- Initialized the global Ecosystem Demography (ED v3.0) with 3.7 billion lidar samples from GEDI and ICESat-2.
- Ran ED forward using climate projections of four CMIP6 Shared Socio-economic Pathways (SSPs) and four ESMs.
- Attributed carbon sequestration to the continued growth of existing and new growth, as well as to contributions from a changing climate and CO2 fertilization.

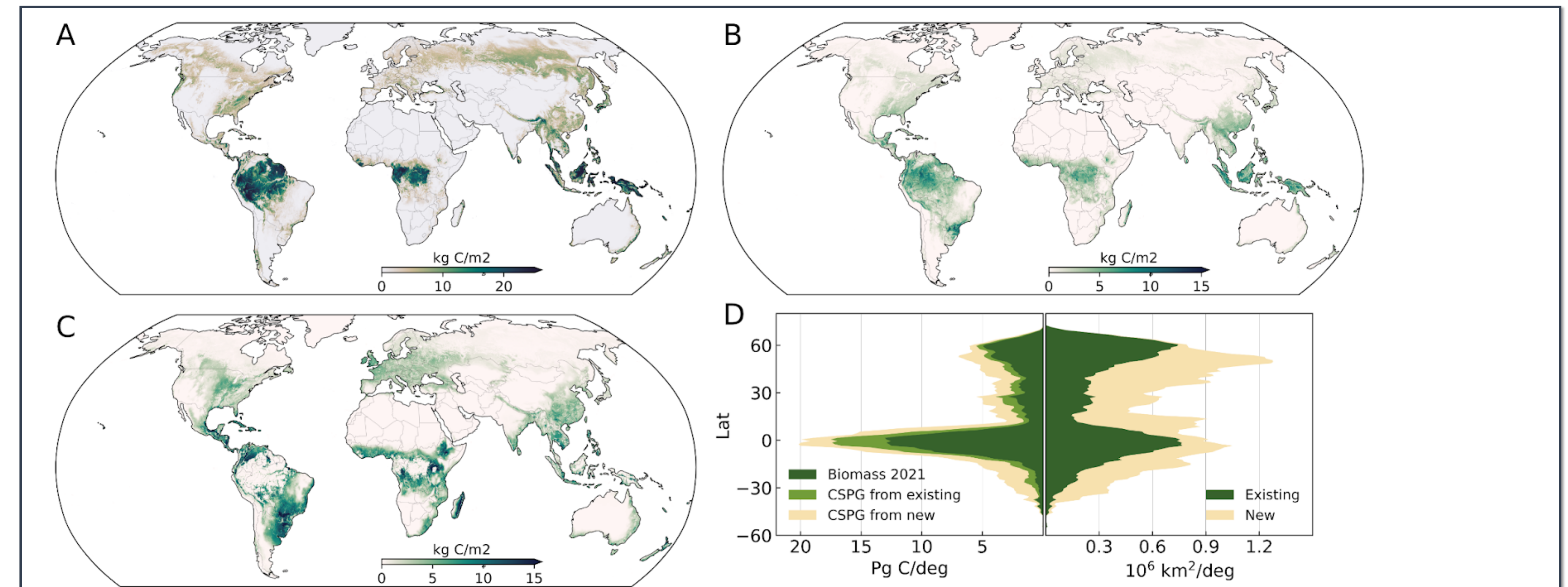


**Figure 1.** Schematic diagram of processes represented in the ED model.

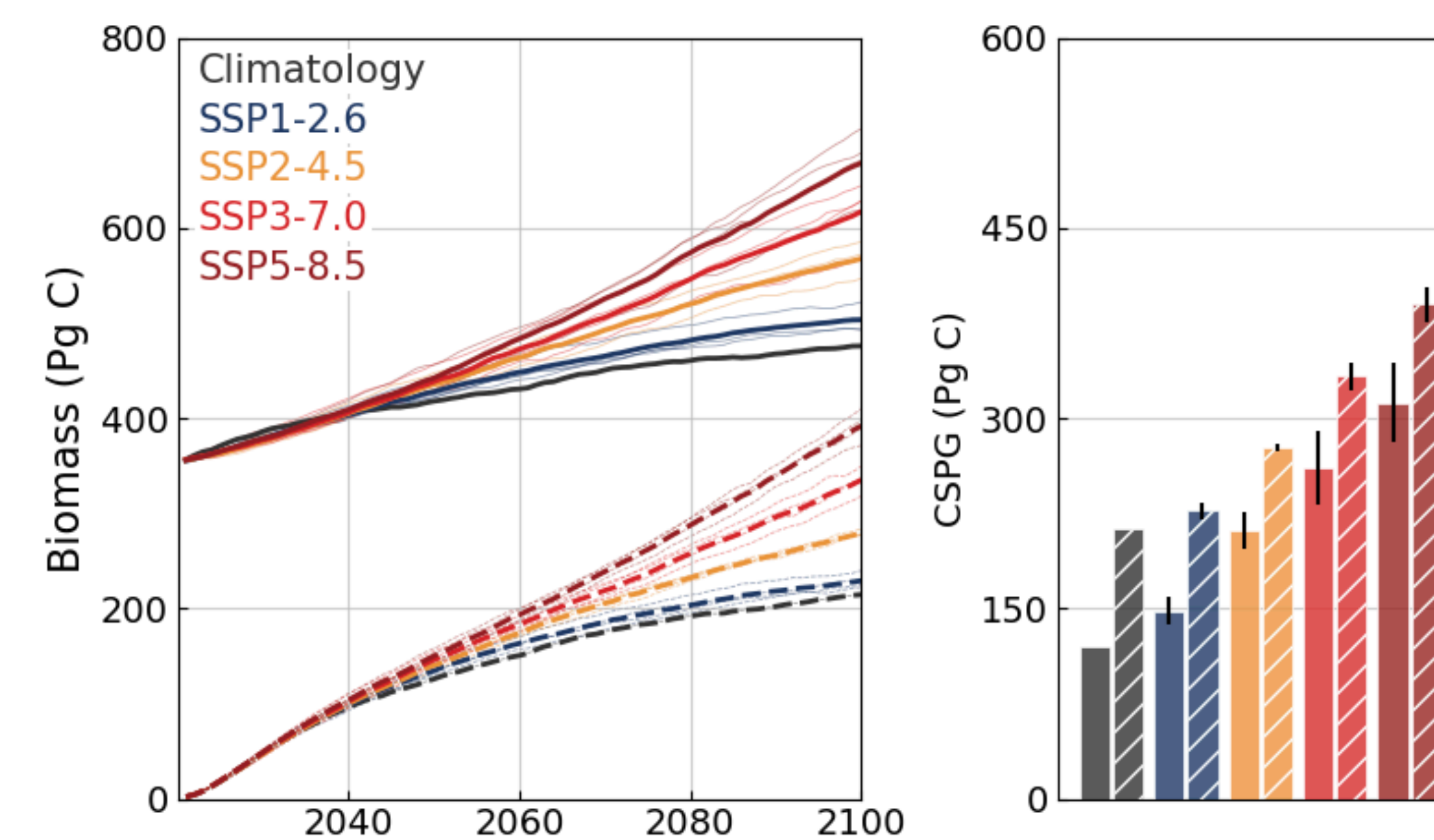


**Figure 2.** Illustration of ED-Lidar initialization using inputs of canopy height histogram and tree canopy cover grid. This initialization estimated current forest carbon stocks.

## Results



**Figure 3 (top).** Global current forest carbon stock and future carbon sequestration by 2100 under present climate. (A) current forest carbon; (B) and (C) Total carbon sequestration gap by 2100 from existing trees and new trees, respectively. (D) Zonal total area, total current carbon stock and future carbon sequestration gap.



**Figure 4 (middle).** Global potential biomass between 2021-2100 under present and future climate. Solid and dash lines and bars represent existing trees and new trees, respectively.

**Figure 5 (bottom).** Global carbon sequestration gap between 2021-2100 from existing and new trees under four SSPs.

