Forest biomass and the Earth's carbon cycle

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Abstract:

Forests play a major role in climate change in two ways: a) they sequester huge amounts of carbon from the atmosphere and turn it into biomass, thus mitigating global warming and b) deforestation and forest degradation destroys biomass and provides a significant source of carbon dioxide to the atmosphere. However, the spatial distribution of biomass and how it is changing is not well-known. To address this gaping hole in our knowledge the European Space Agency launched its BIOMASS satellite in April 2025. I was the joint proposer of this mission and led its science team in the 20 years from its proposal to its launch. This talk will describe the mission and the underlying science but will also use a simple analytic model to clarify what controls forest biomass. This model describes carbon flow through a forest system, and explains why forests can only serve as a relatively short-term brake on global warming