iED: A new framework to integrate future vegetation disturbances in climate mitigation strategies.

Remote sensing, Ecosystems dynamics, Human system --> Climate mitigation

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- NACP 2013, Albuquerque -

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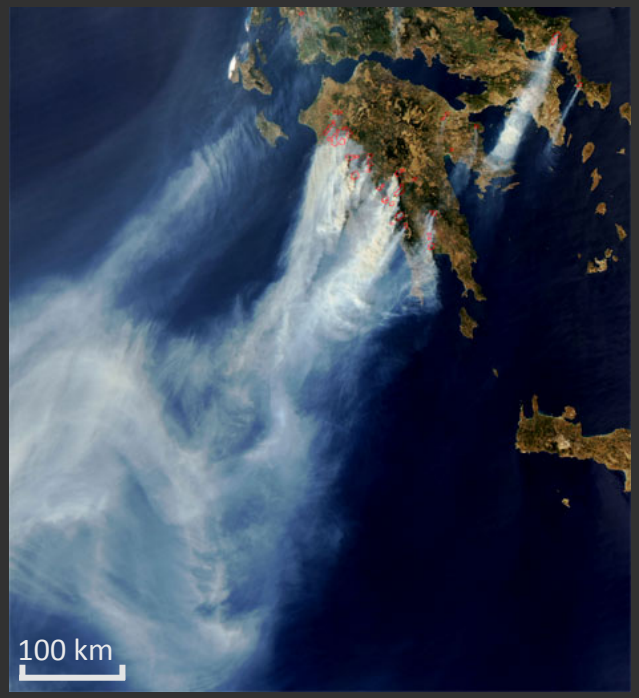
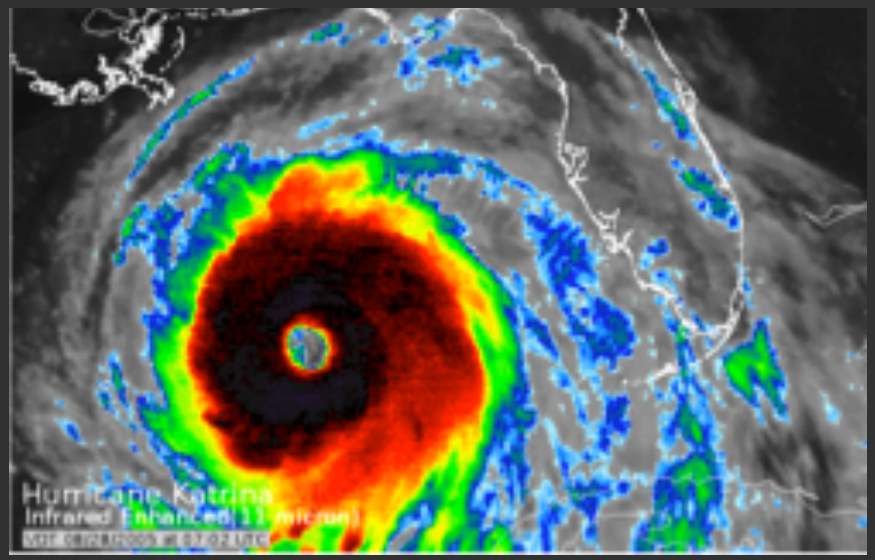
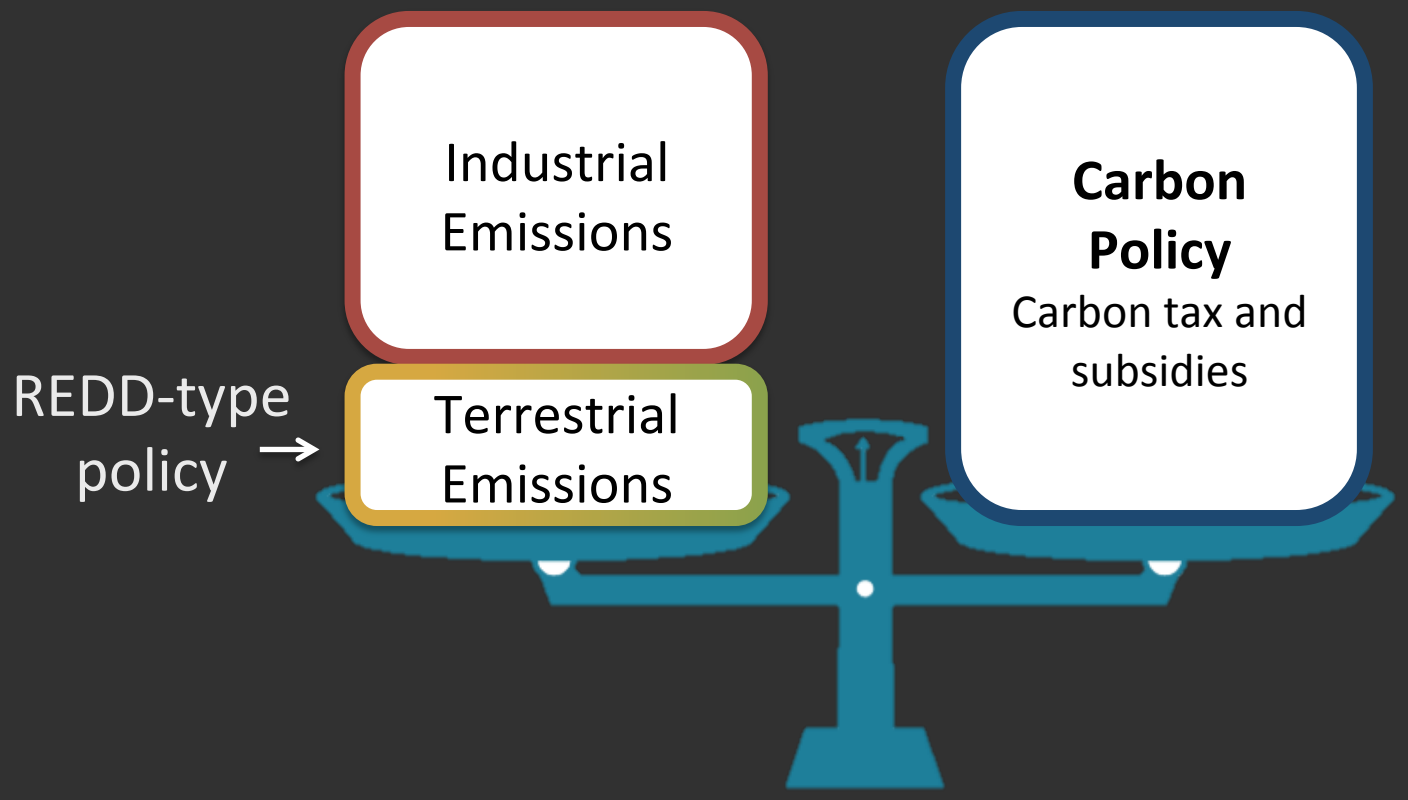




Sources: U.S. National Digital Library, Earth Observatory, N. Forest Products Association

Objectives

To what extent would we have to adapt climate mitigation strategies if disturbance rates change ? Can we anticipate ?



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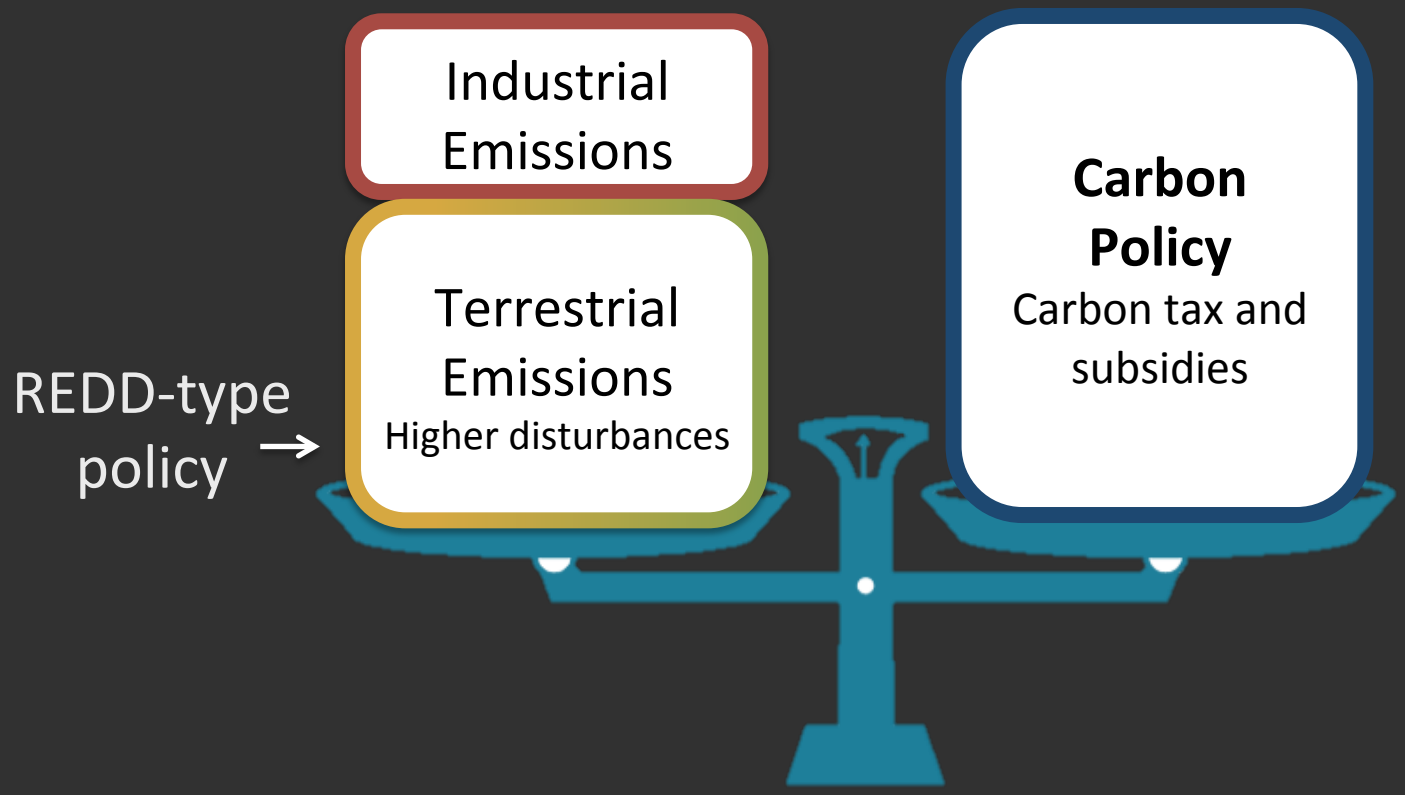
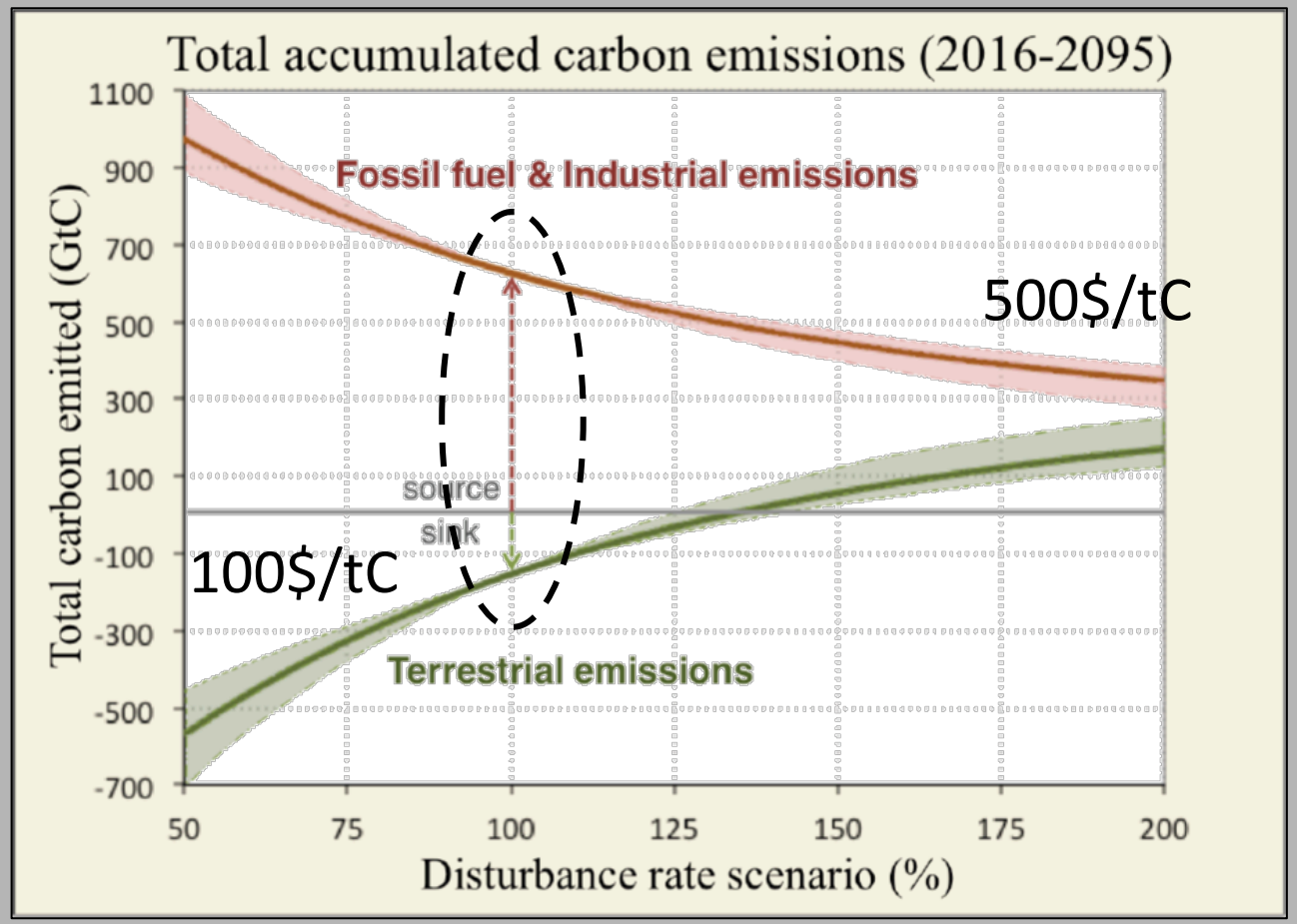


Impacts on mitigation strategies in GCAM

Mitigation policy
< 3°C warming



Le Page *et al.*, ERL 2013

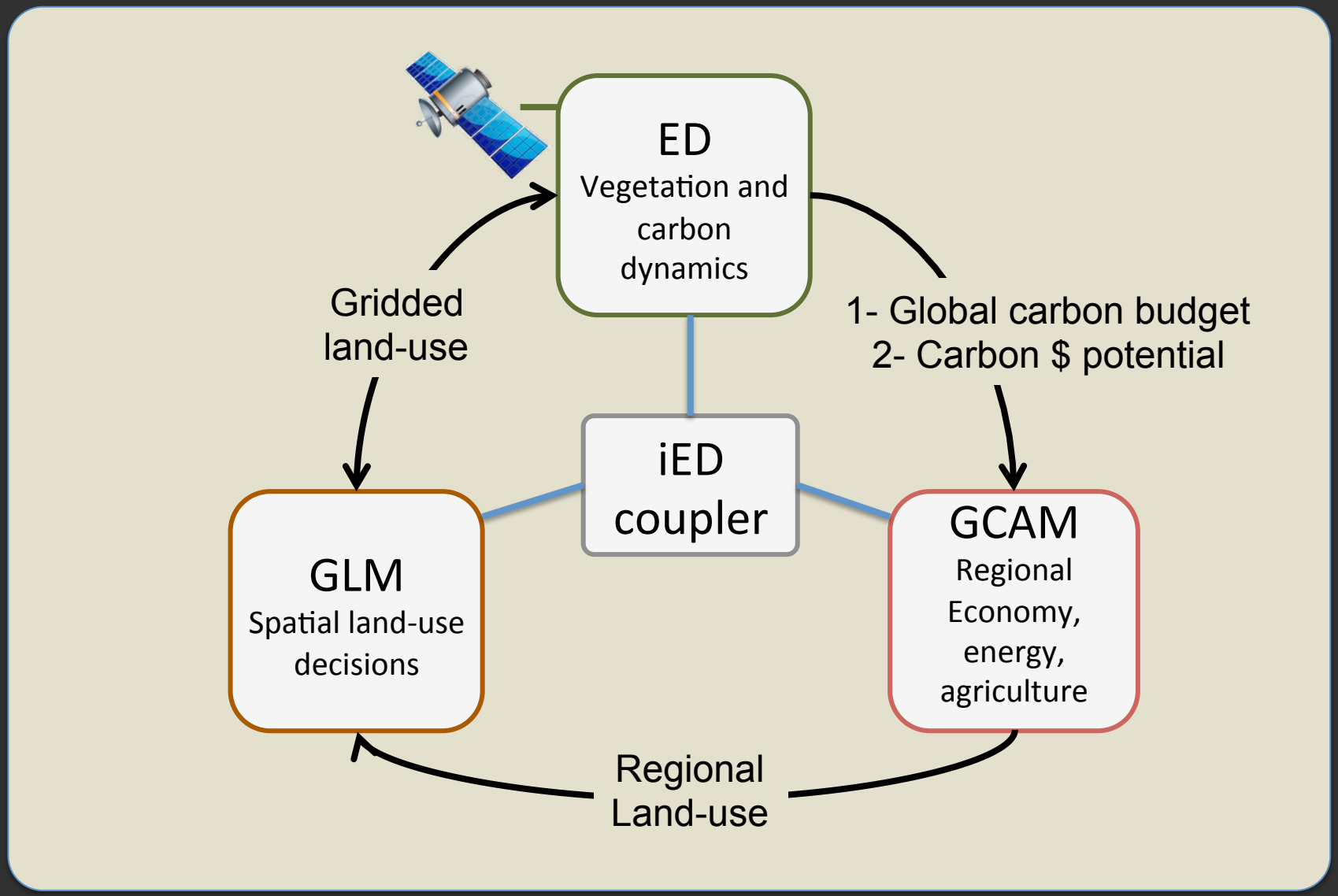
Impacts on mitigation strategies

- Strong indications that mitigation strategies are sensitive to disturbances.

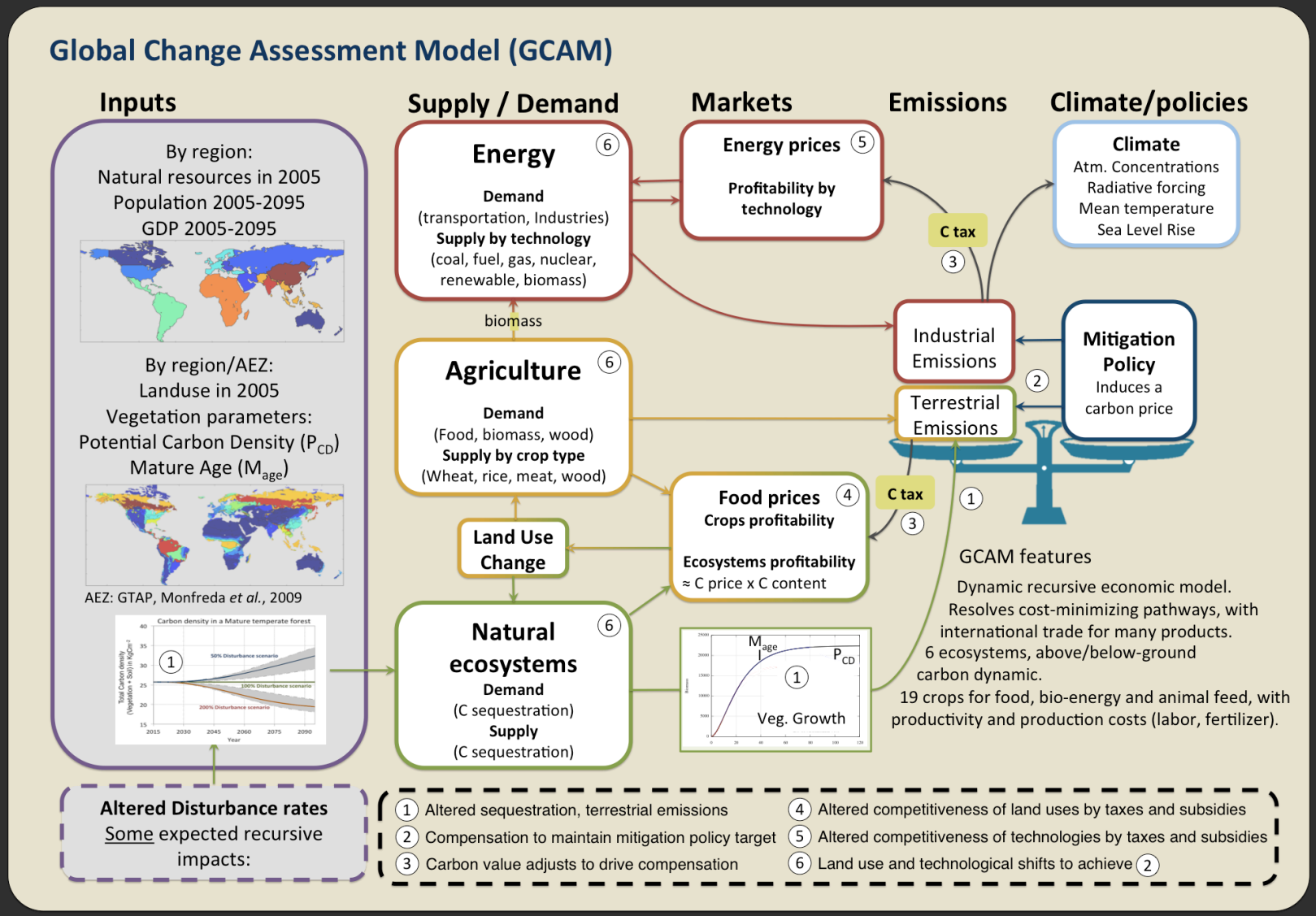
- Future disturbance rates and impacts ?
    - By disturbance types
    - In an integrated way

-> iED: coupling GCAM to a detailed Ecosystem model

iED: Framework

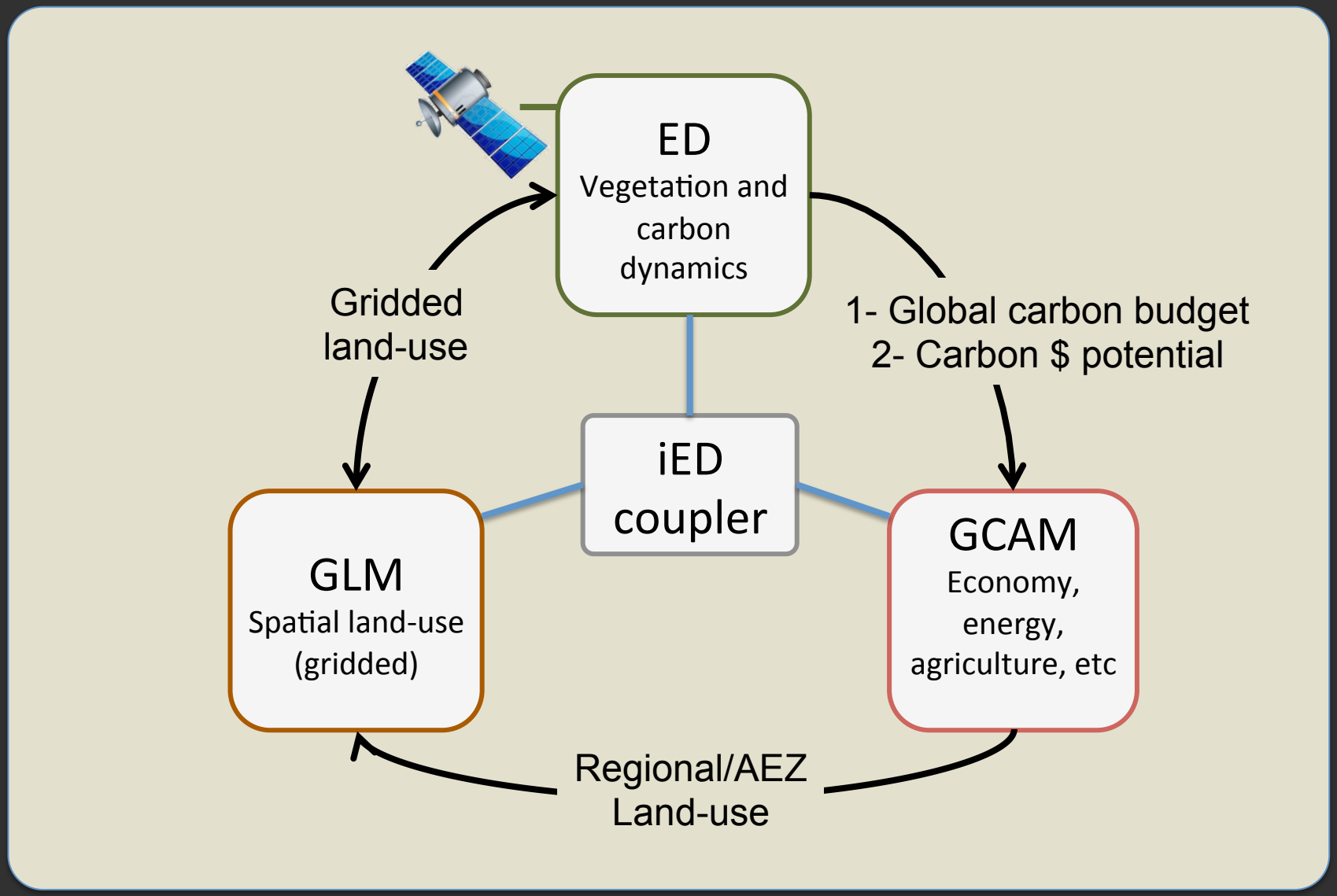


Global Change Assessment Model (GCAM)

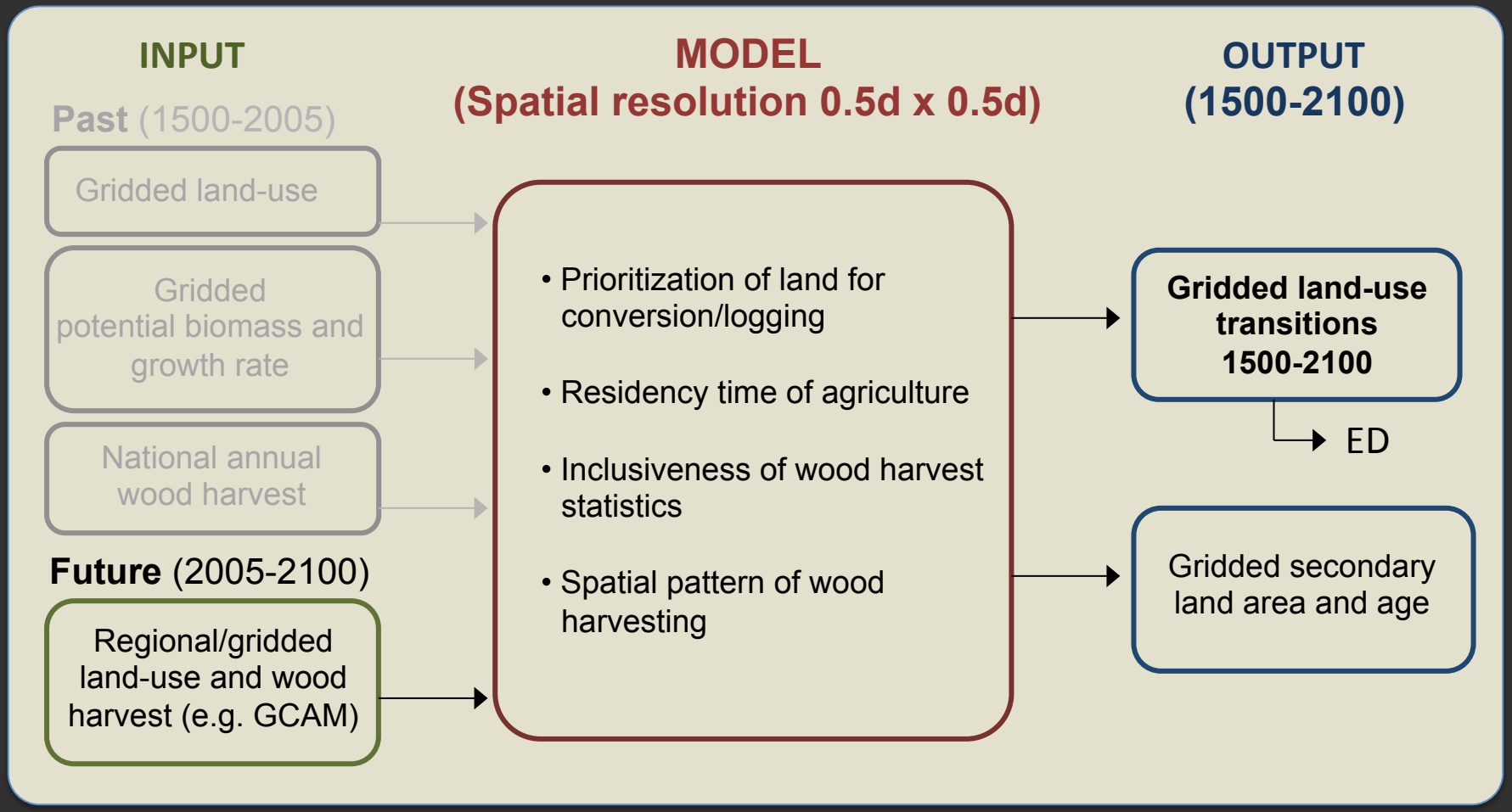


More details: http://wiki.umd.edu/gcam - Wise *et al.*, Science 2008 – Thomson *et al.*, Climatic Change 2011

iED: Framework

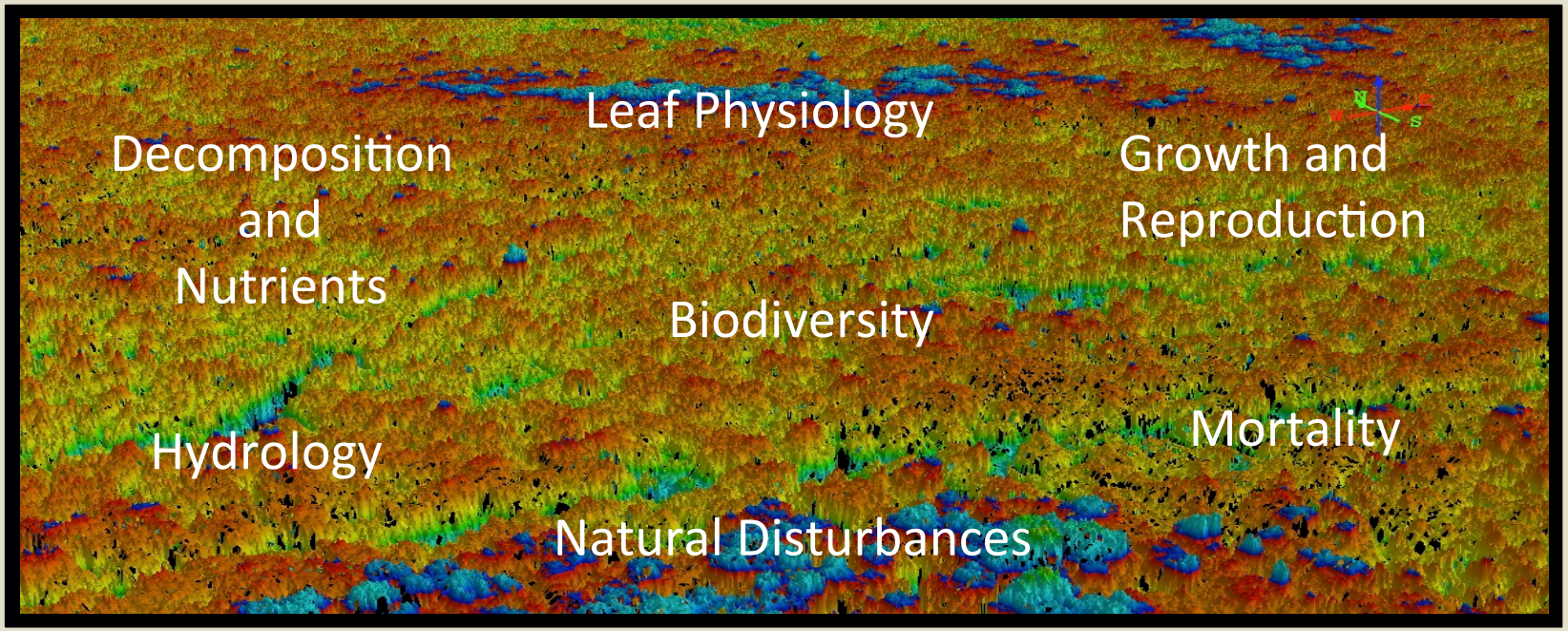


The Global Land-use Model (GLM)



Hurtt *et al.*, Clim. Change 2011

The Ecosystem Demography model (ED)



Forest structure from high resolution Lidar

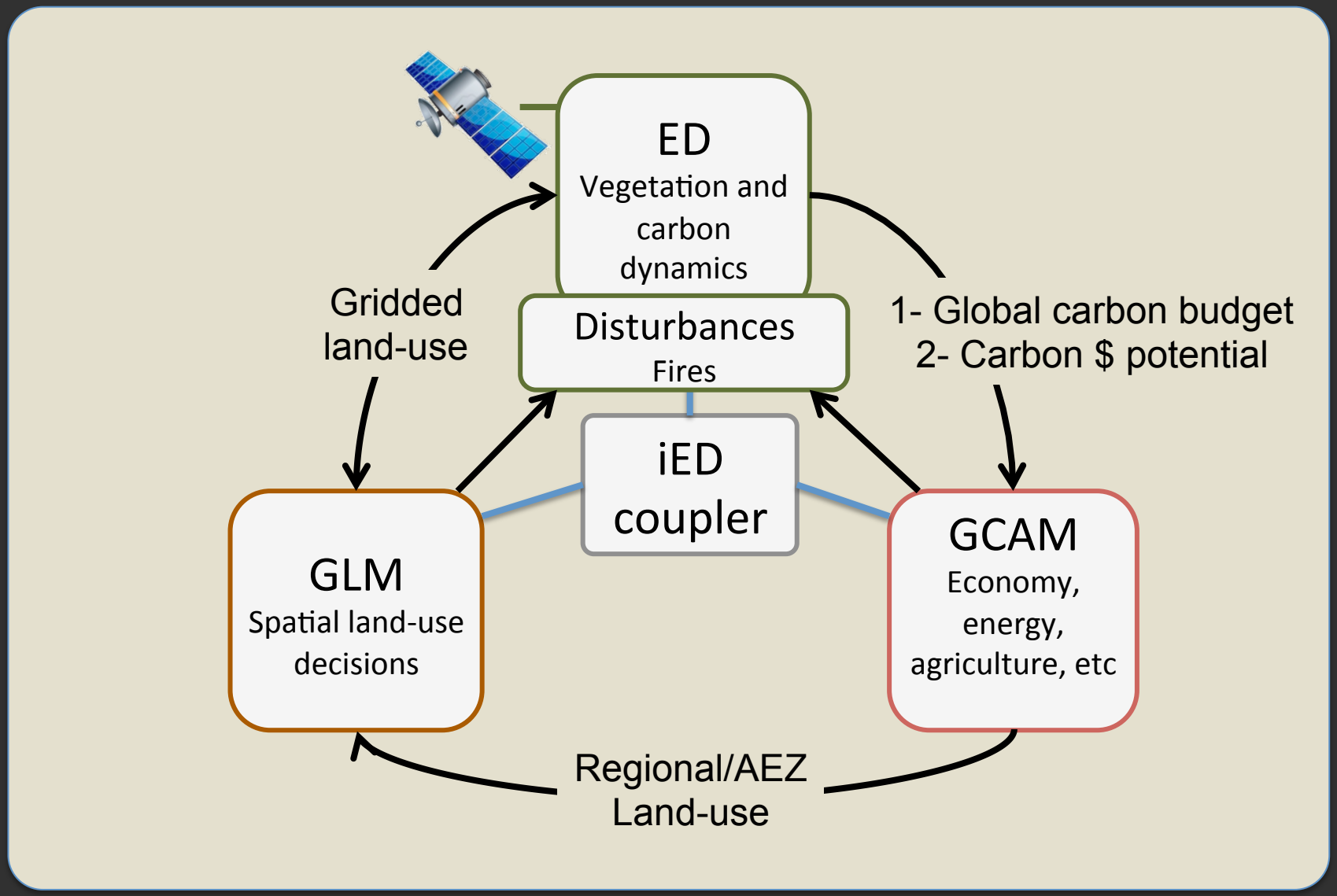
Spatial Scales: Tree cohorts → Stands → Grid-cells → Regions

Time Scales: Hours → Centuries

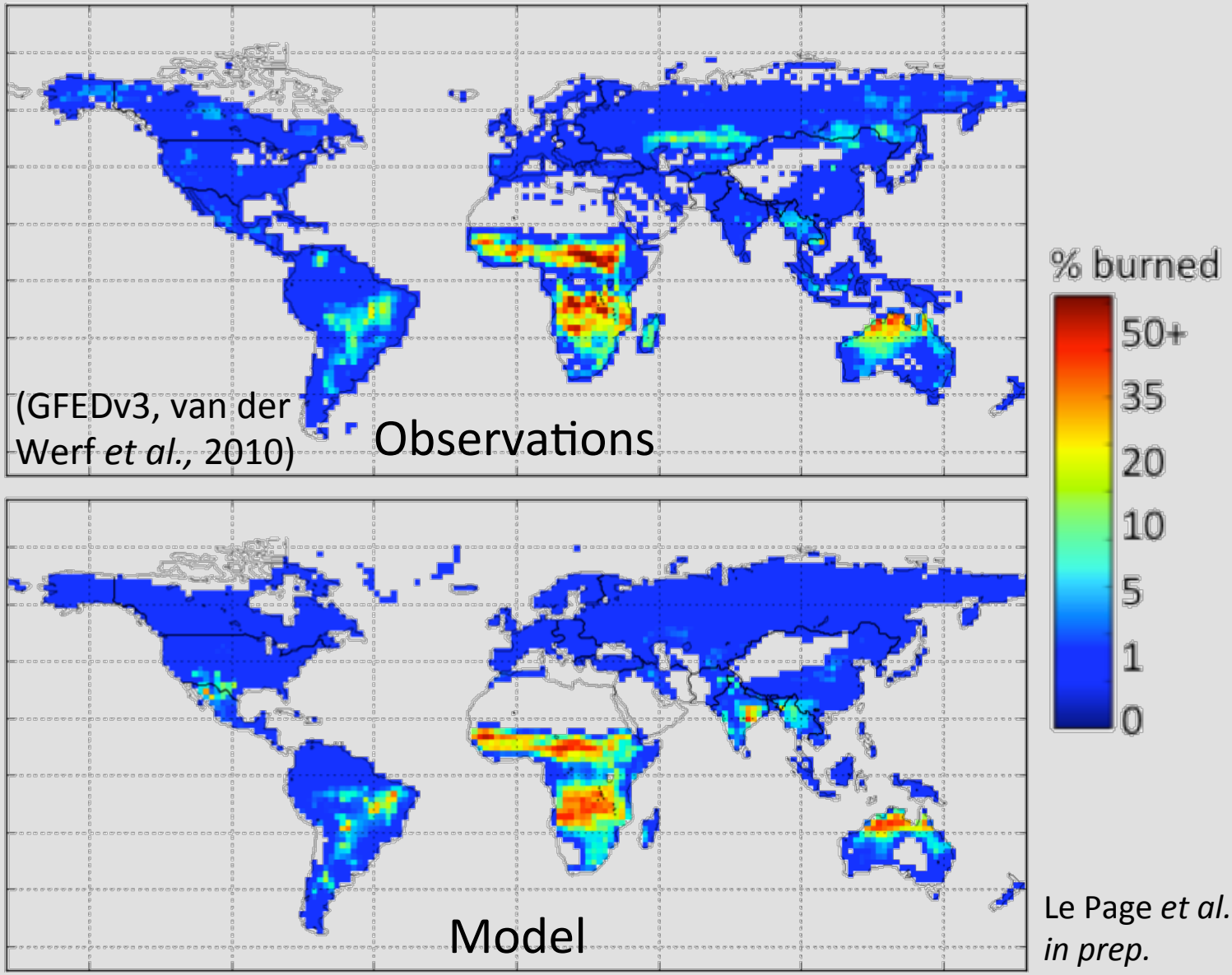
Enables process-level modeling of disturbances,
their impacts, their legacy on ecosystems.

Hurtt *et* al., GCB 1998 ; Moorcroft *et al.*, Ecol. Mono. 2001 ; Hurtt *et al.*, Eco. Soc. Am. 2004

iED: Framework



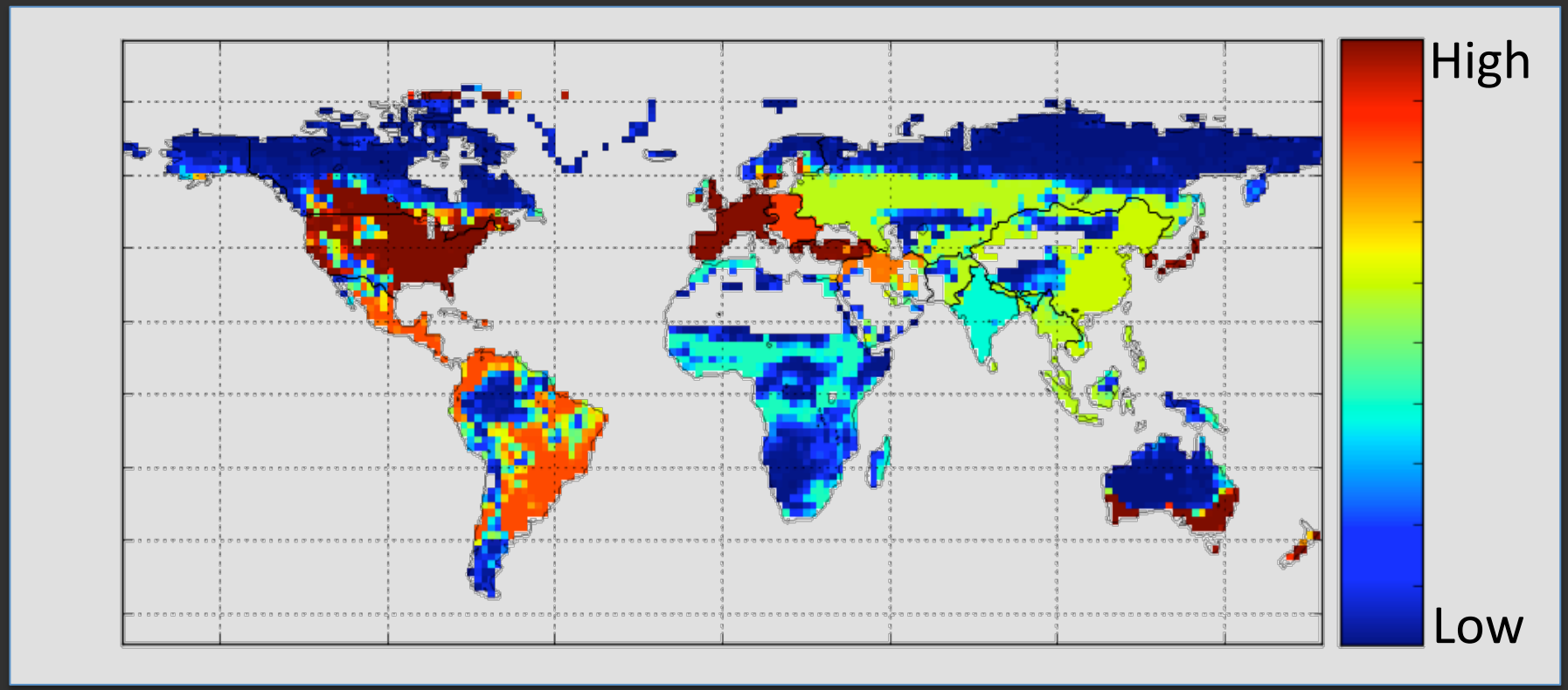
Modeling fires in an anthropogenized world



Le Page *et al.*, *in prep.*

Modeling fires in an anthropogenized world

Suppression effort
a function of landuse and GDP



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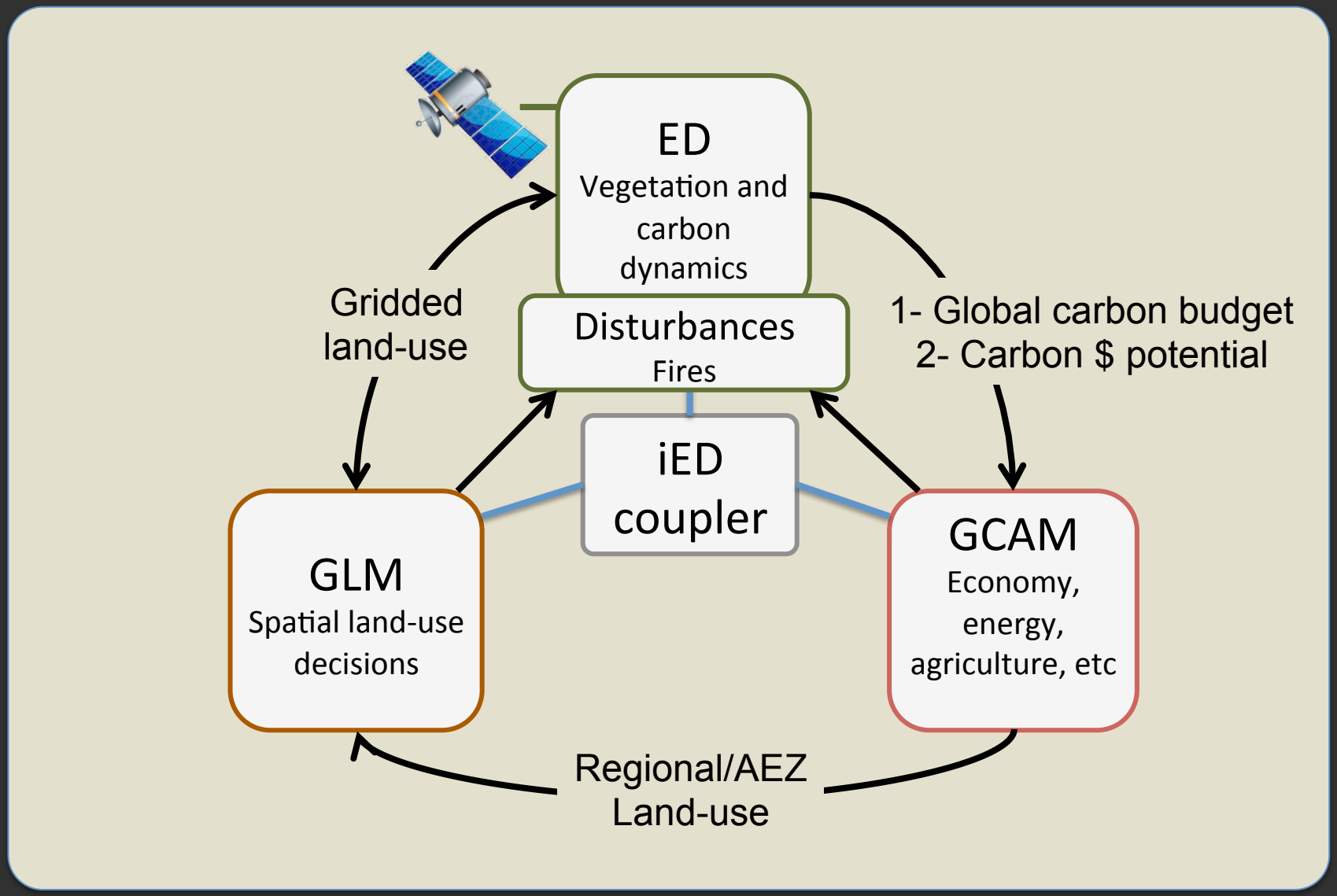
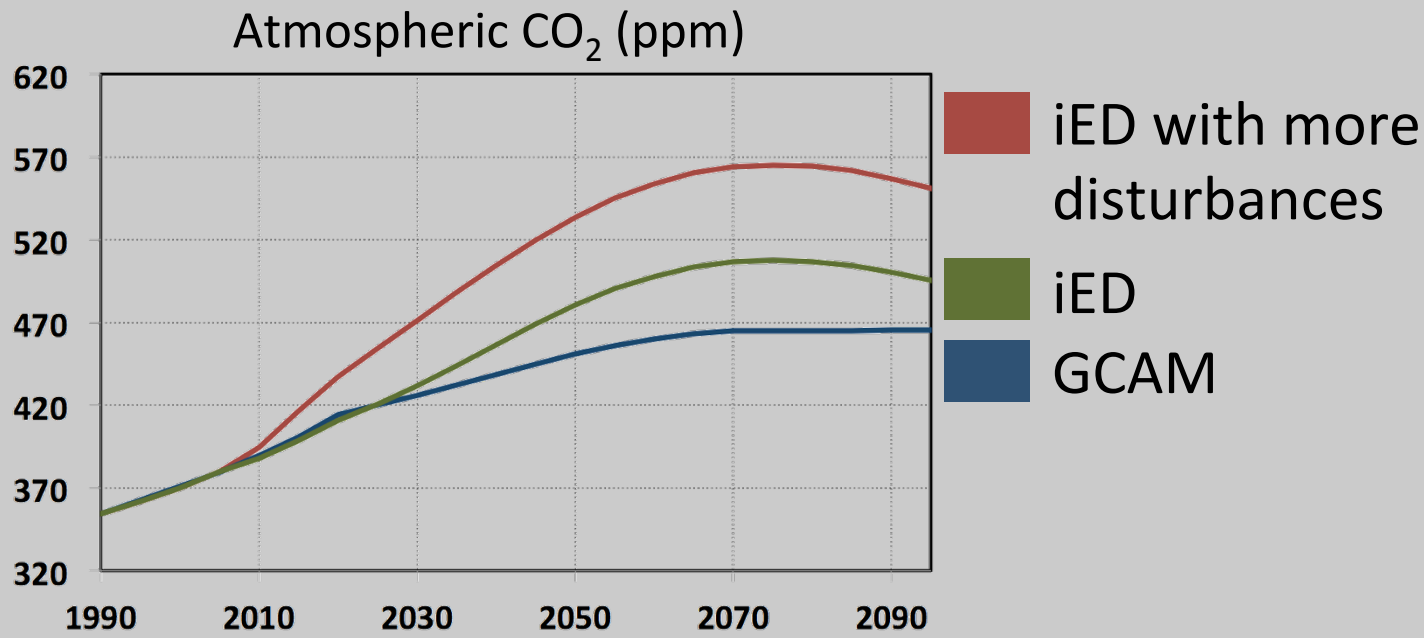
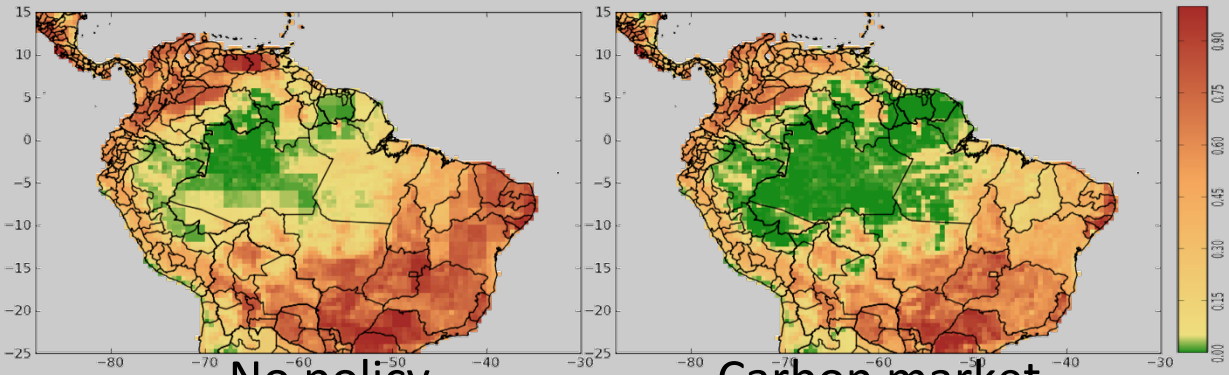
iED: Framework



iED



Landuse expansion in the Amazon -> fire ignitions



No policy

Carbon market

Le Page *et al.*, *in prep.*

Conclusions

- Integrated framework highlights interactions between the economy, energy, land-use, vegetation/carbon dynamics, and climate mitigation.
- Facilitates direct connections to advanced remote sensing for improved modeling and mission support.
- Allows for explicit treatment of both human (e.g. land-use) and natural disturbances.
- Alternative aspects. E.g. food security, climate, biodiversity, permafrost.