

What open data tells us: Reconstructing six decades of global land use change

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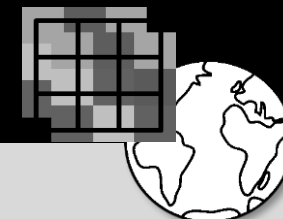
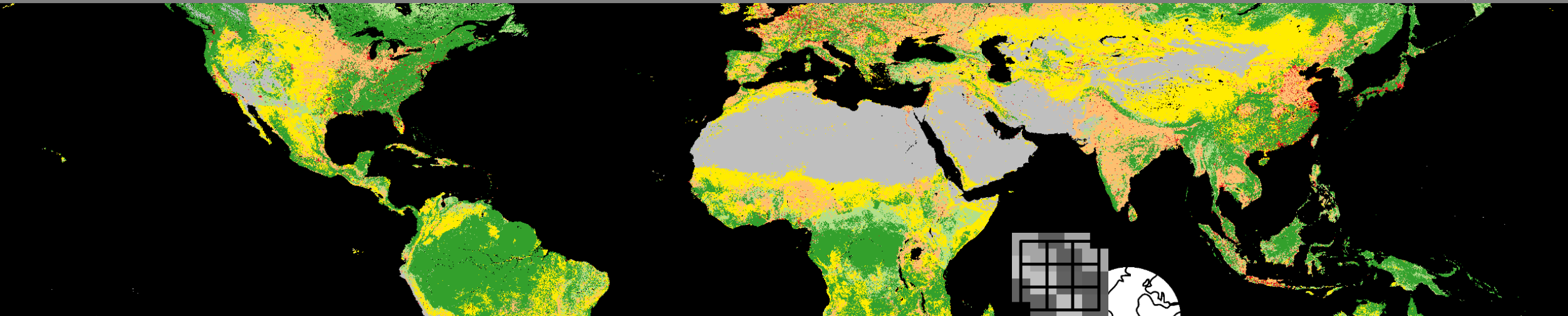
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Land Use Change and Climate Research Group



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IMK-IFU: Atmospheric Environmental Research







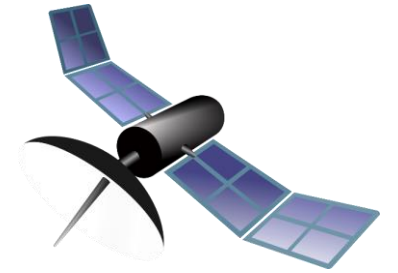
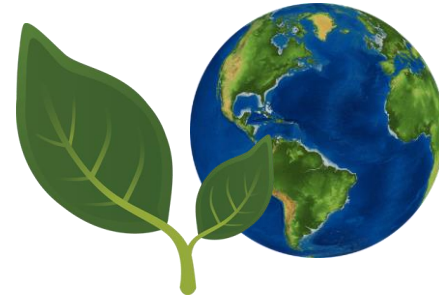
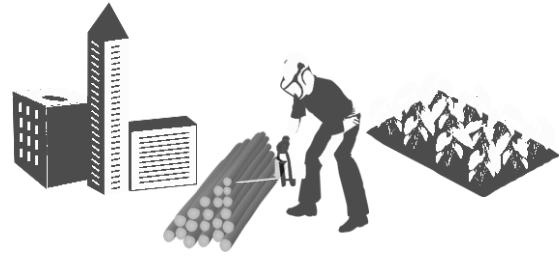
Land use/cover (LULC) change

is land surface change. Land use describes the human use of land, while land cover the biophysical characteristics of the land surface (Zvoleff et al., 2014).

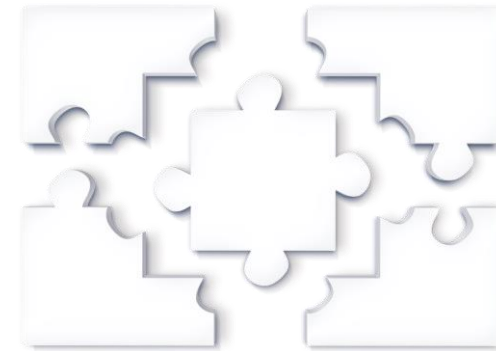
>80% of the global land surface has been managed.
(Luyssaert et al., 2014, Arneeth et al., 2019)

2nd largest contributor to greenhouse gas emissions.
(Le Quéré et al., 2013)

Why?

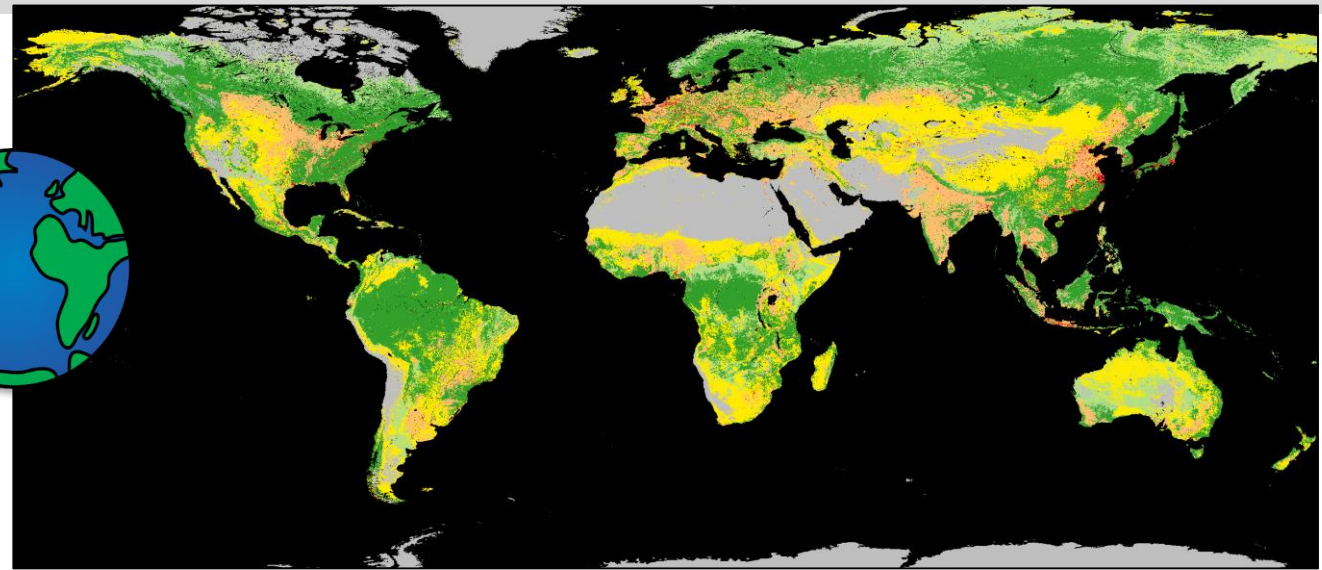
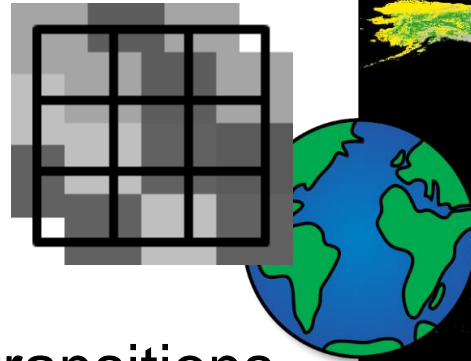


- Land use is key for tackling challenges:
Food security, climate change and biodiversity loss
- Learning from the past to shape the future – the need of reconstructions.
- Available reconstructions are fragmented.
 - SAGE croplands (Ramankutty & Foley 1999)
 - HYDE 3.2 (Klein Goldwijk 2017)
 - LUH2 (Hurtt 2011)
- Satellite era: Time to use the synergies of high resolution and long-term data sets.

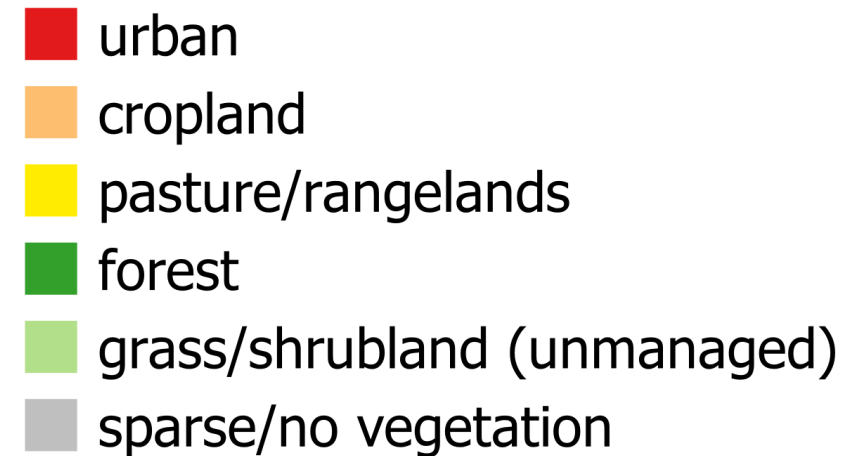


HiLDA+

Historic Land Dynamics Assessment+



- global, 1 km grid
- LULC distribution and transitions (1960-2015/2019)
- LULC fractions (mutual agreement of input datasets)

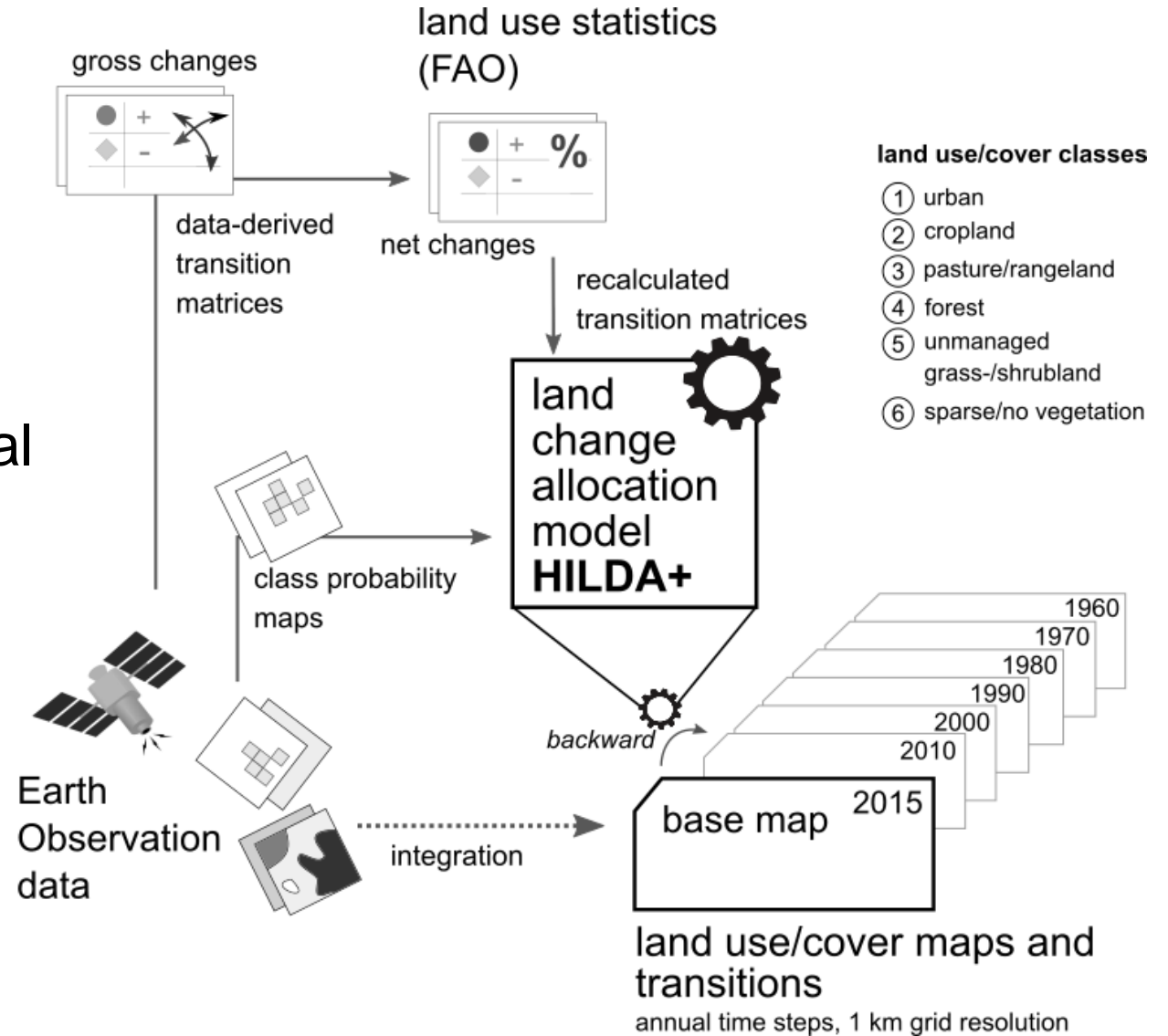


Burning questions...

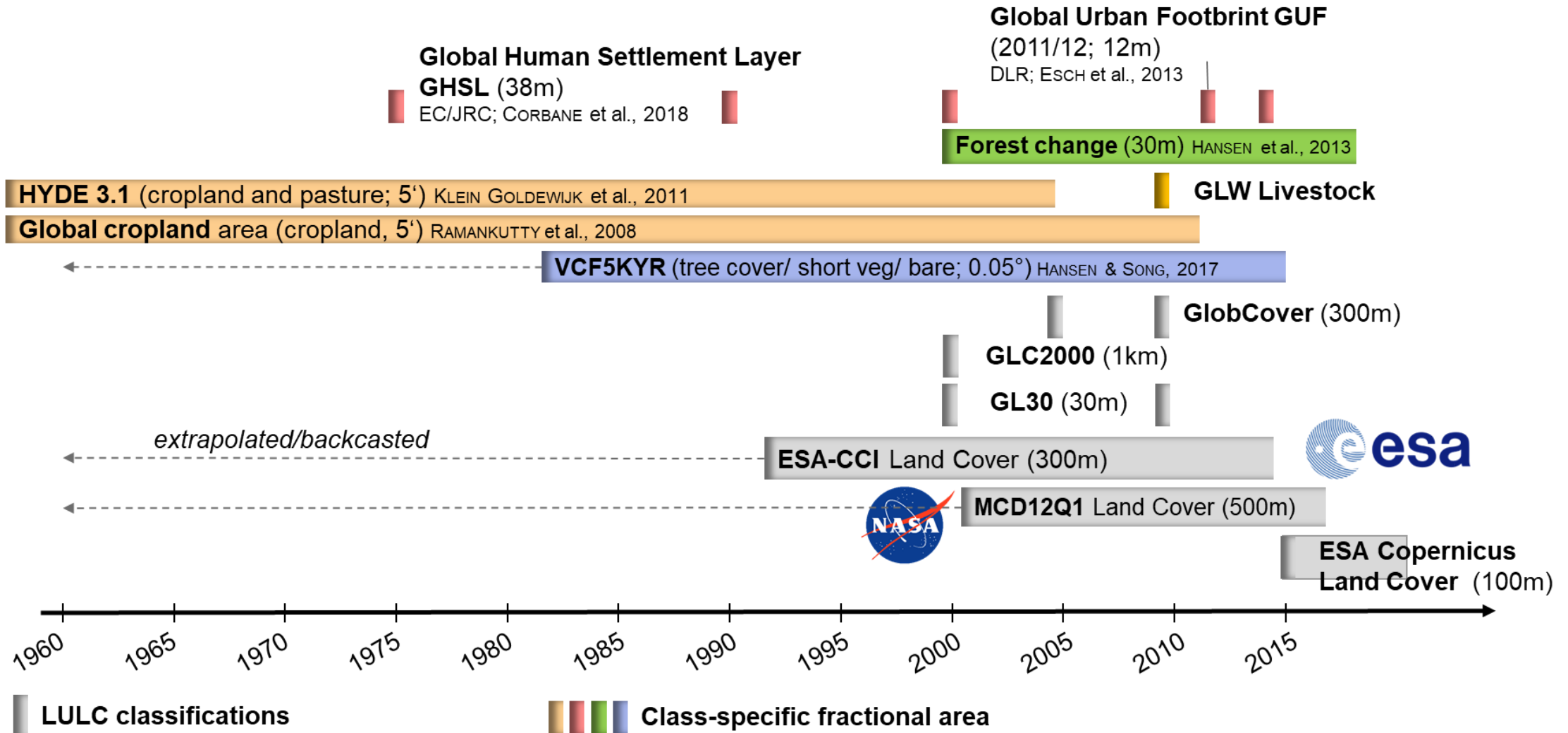
- Where and how did land use/cover change?
- What are the main drivers?
- How are land use change patterns interlinked?

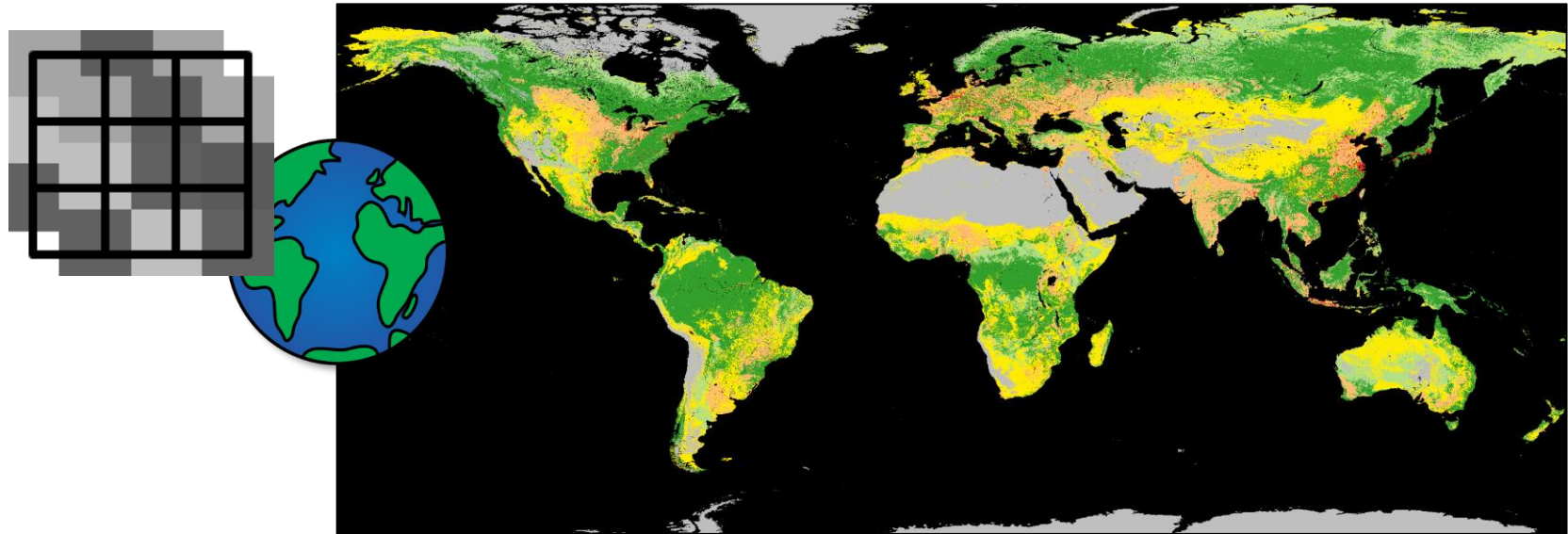
Approach

- Harmonising FAO land use statistics (long-term trends) with remote sensing data (high spatial resolution and coverage)
- Data-driven reconstruction: allocating land use/cover transitions



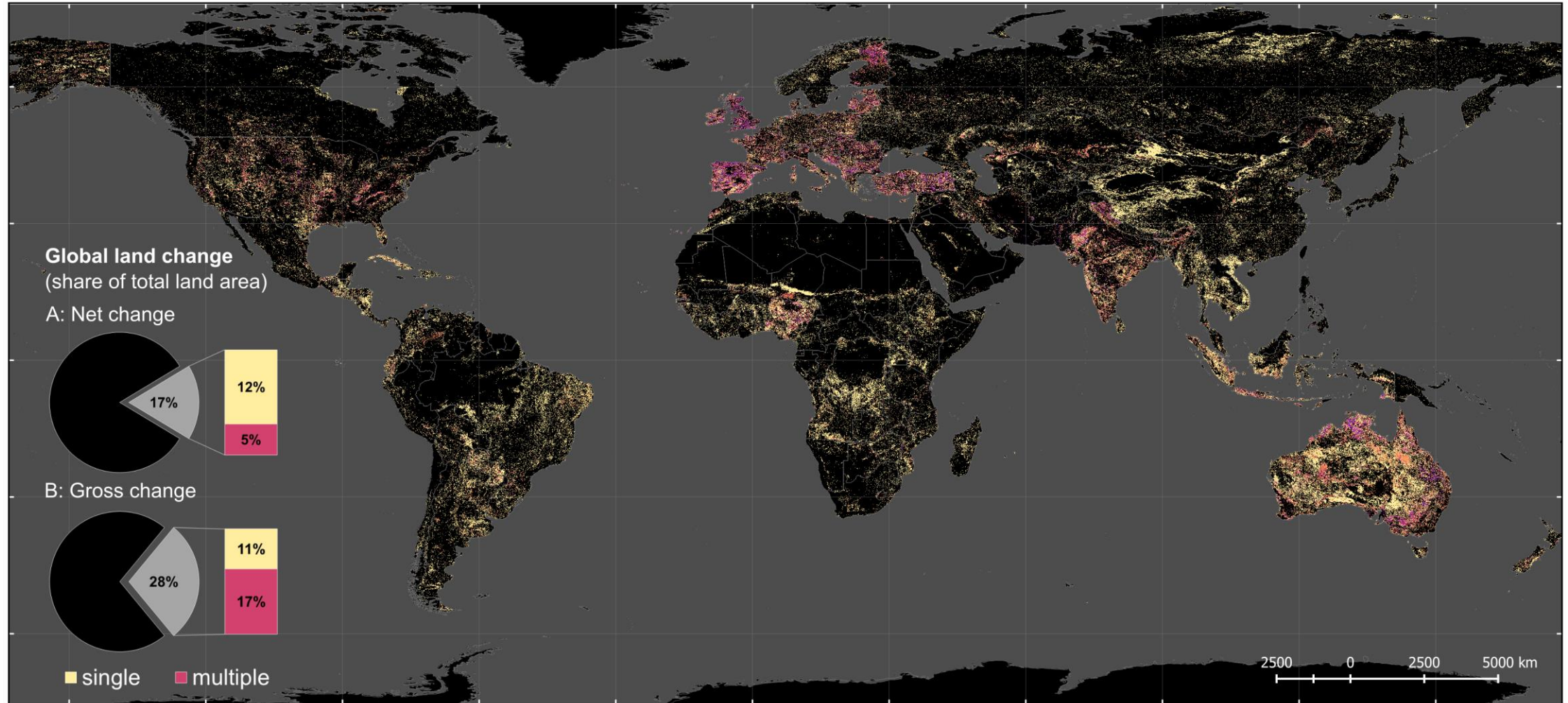
Spatial data on global land use/cover



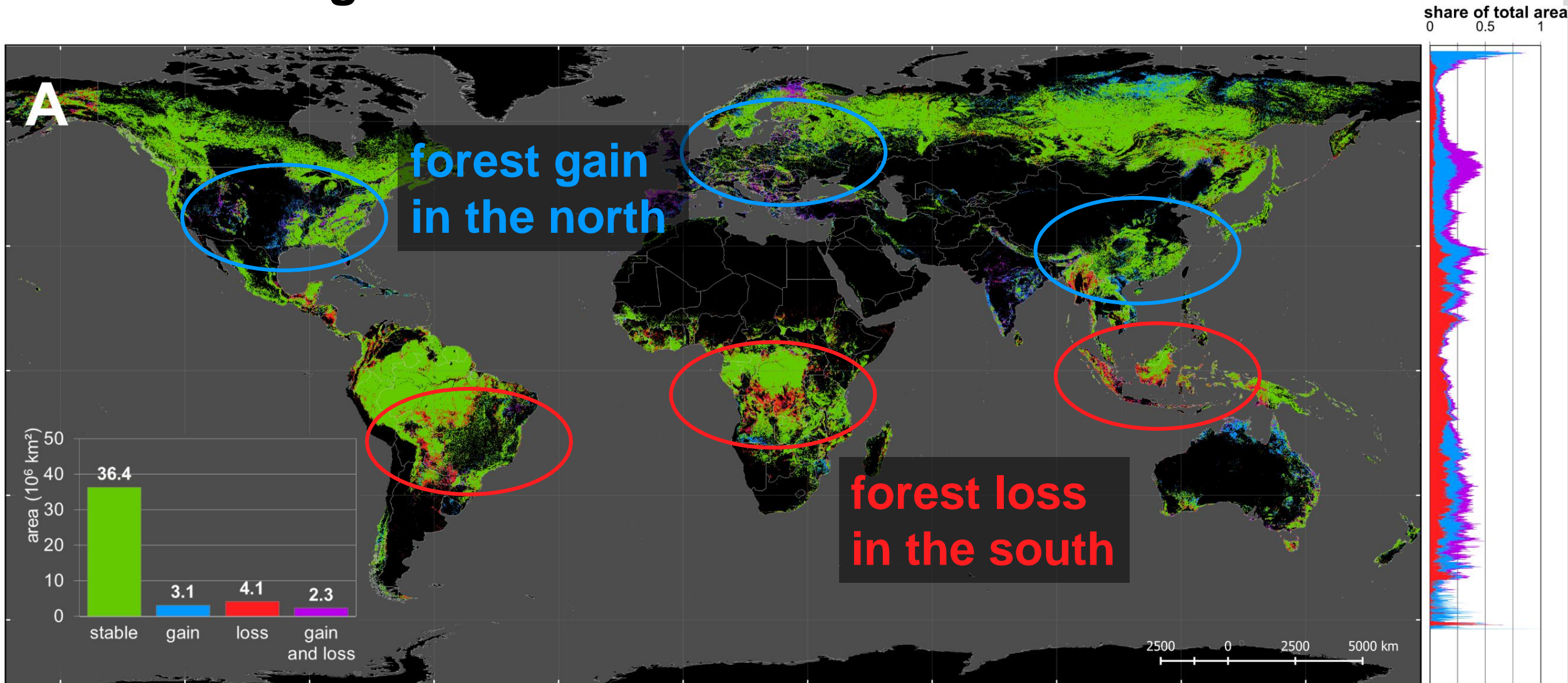


HiLDA+ insights

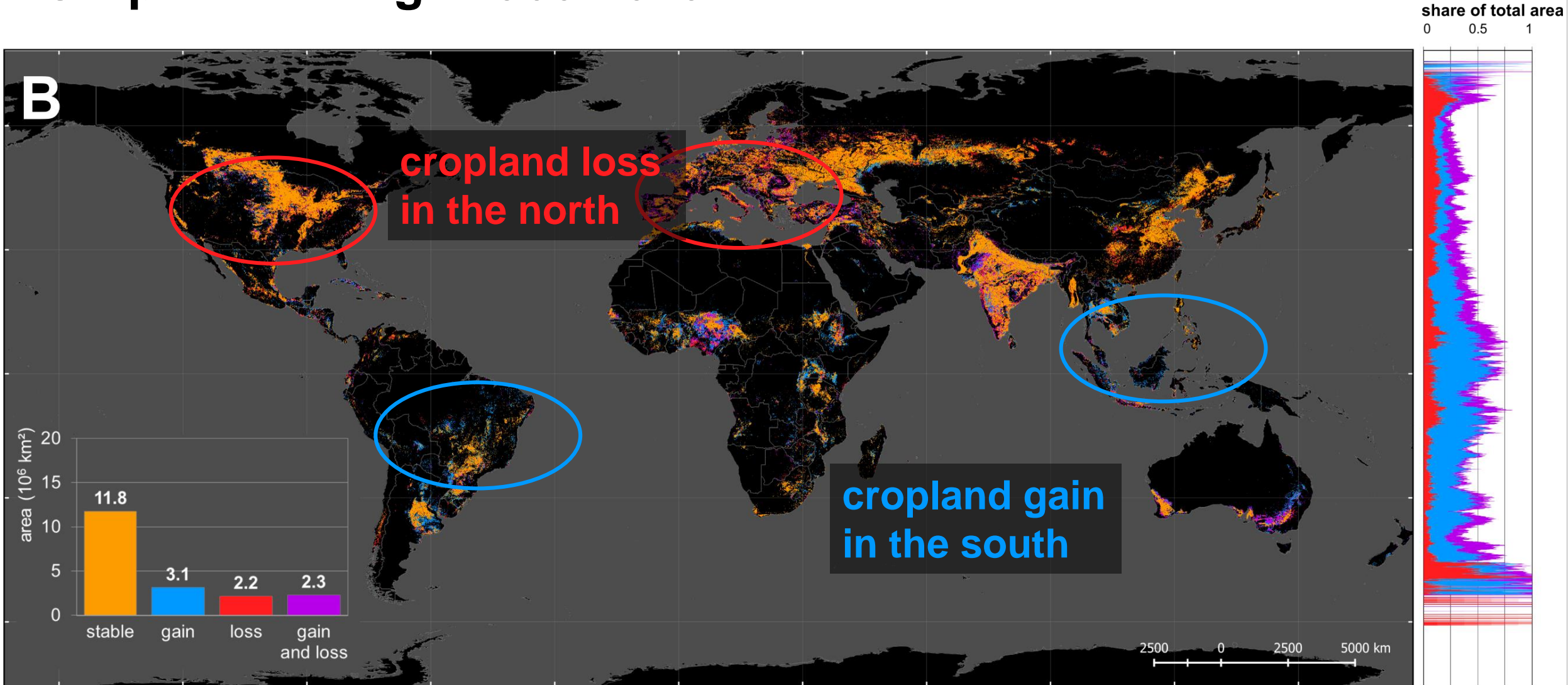
How much land has changed?



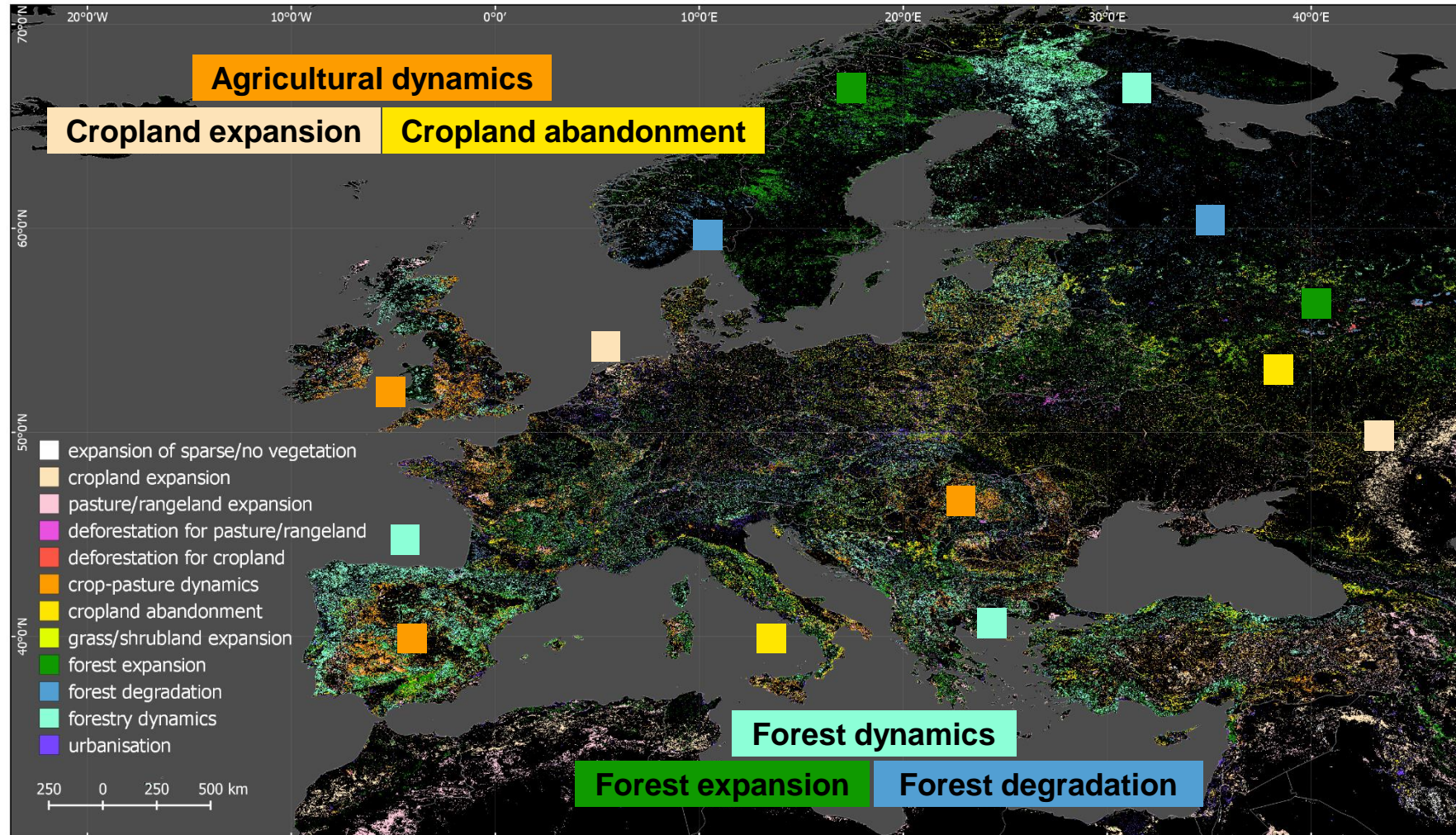
Forest change 1960-2019



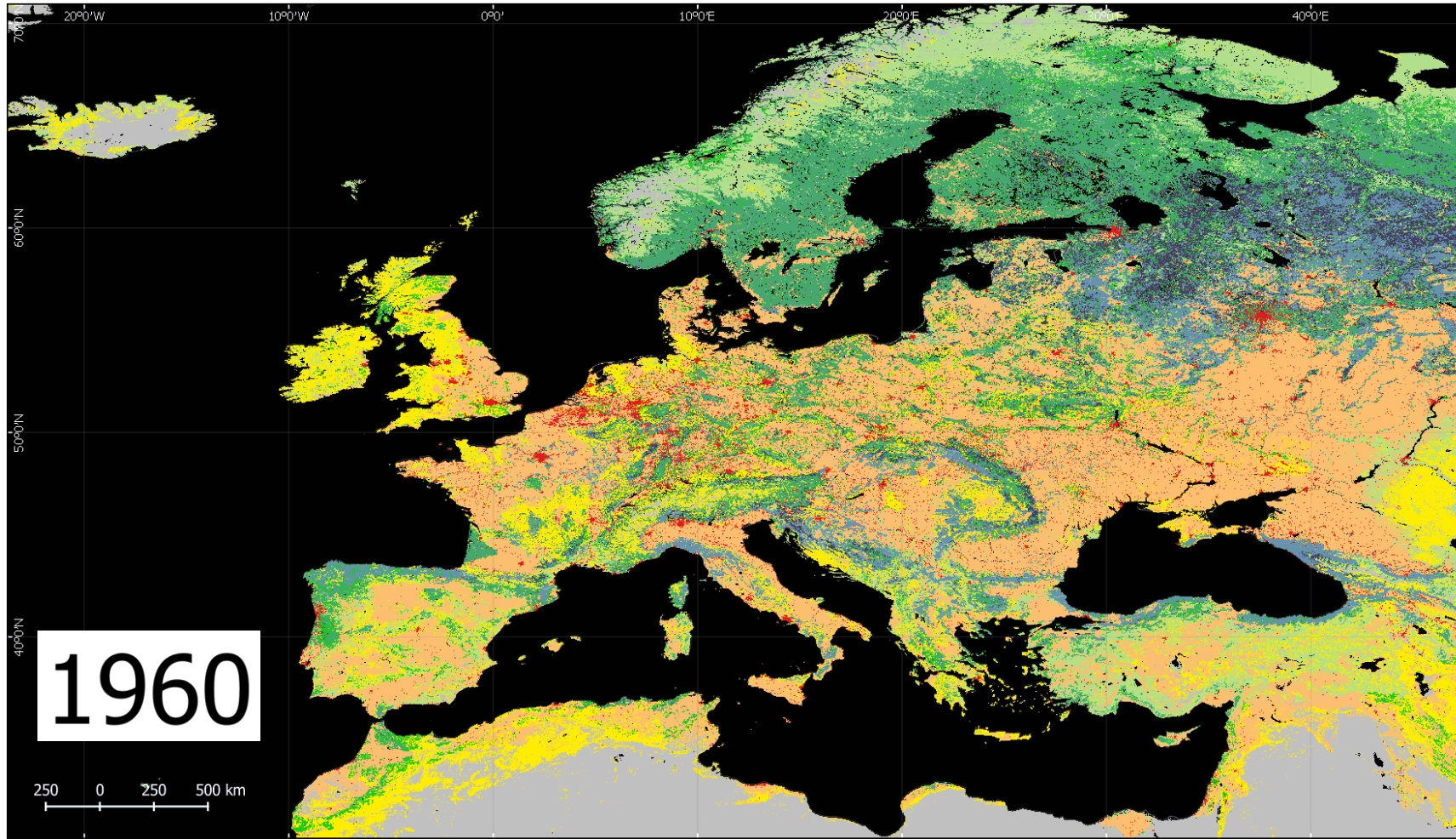
Cropland change 1960-2019



What has changed? Land use/cover change processes



Land use/cover change in Europe 1960-2019

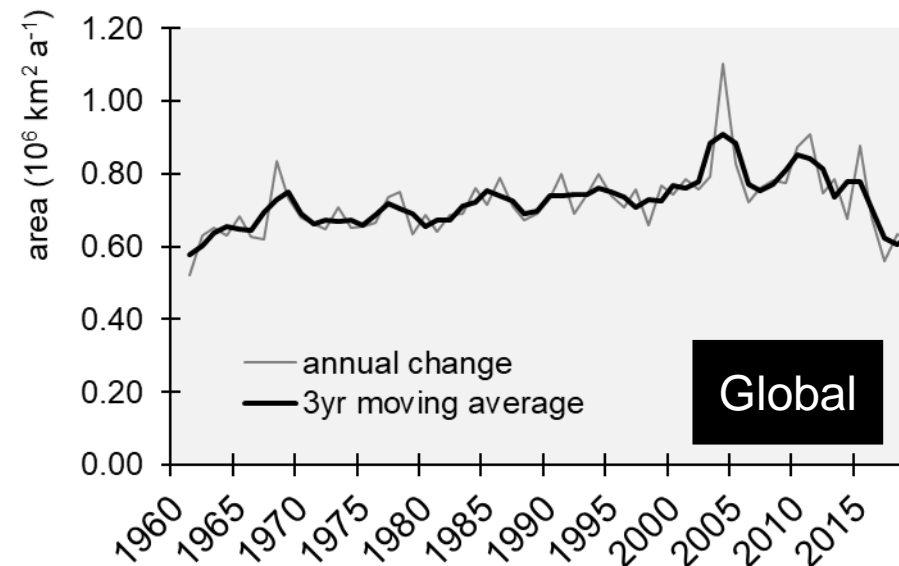
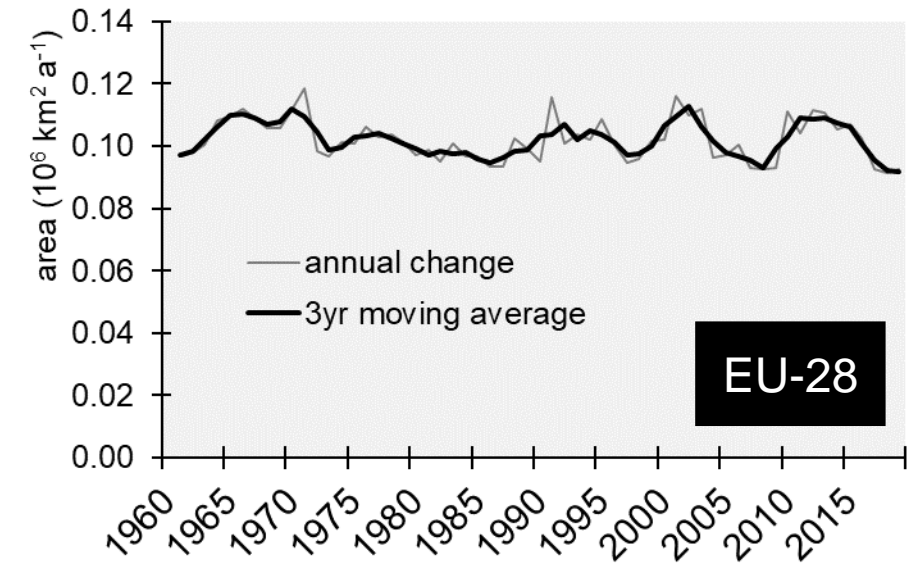


- urban
- cropland
- pasture/rangeland
- forest (deciduous, broad leaf)
- forest (unknown/other)
- forest (evergreen, needle leaf)
- forest (evergreen, broad leaf)
- forest (deciduous, needle leaf)
- forest (mixed)
- grass/shrubland
- sparse/no vegetation
- water

Timing of land use/cover change

Global acceleration →
deceleration?/ fluctuations

- Growing influence of globalised markets: commodity crops, bioenergy demand, land trade
- Economic crisis 2007-2009
- Extreme events



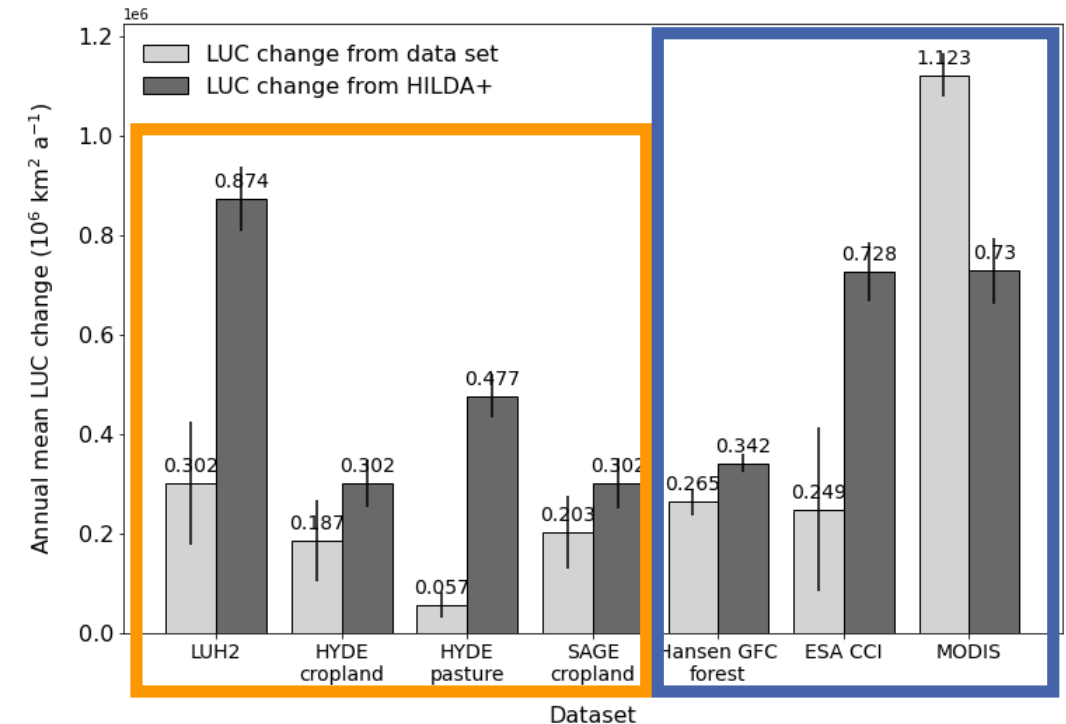
HiLDA+ compared to...

Land Use Reconstructions

Four times more land use change!

Remote Sensing datasets

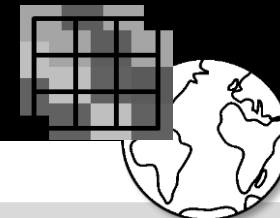
Same order of magnitude, but deviations due to differing/mixed land use/cover classes and semantics



In summary...

- Data on land use change are diverse.
- Combination of Open observational and inventory data adds more detail to and improves understanding of global land use change processes.
- Land use change is greater than previously assumed. Impact on GHG inventories?
- Patterns differ across the globe, but are interlinked by e.g. globalised trade.

Thanks for listening!
Follow the HiLDA+ project on
landchangestories.org



References

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