

Persistently high CH_4 emissions 10 years after restoration: The necessity for long-term observations when measuring GHG emissions of transitional systems

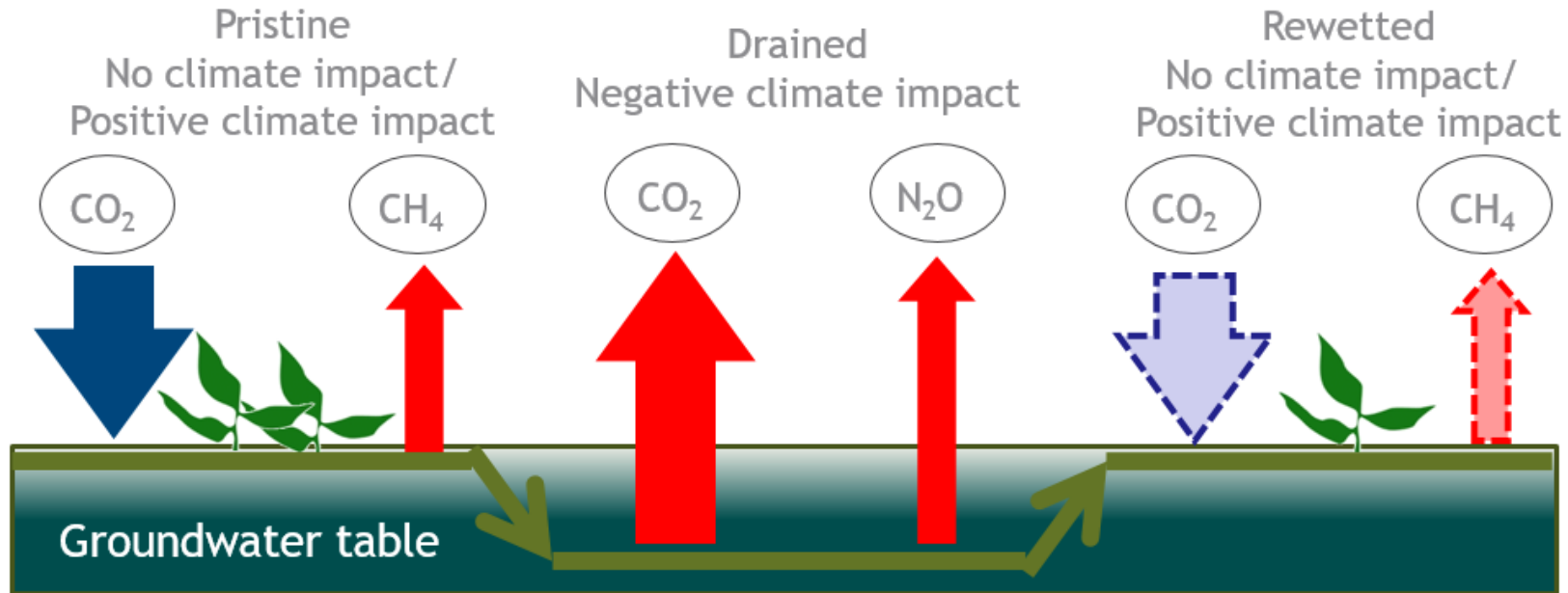
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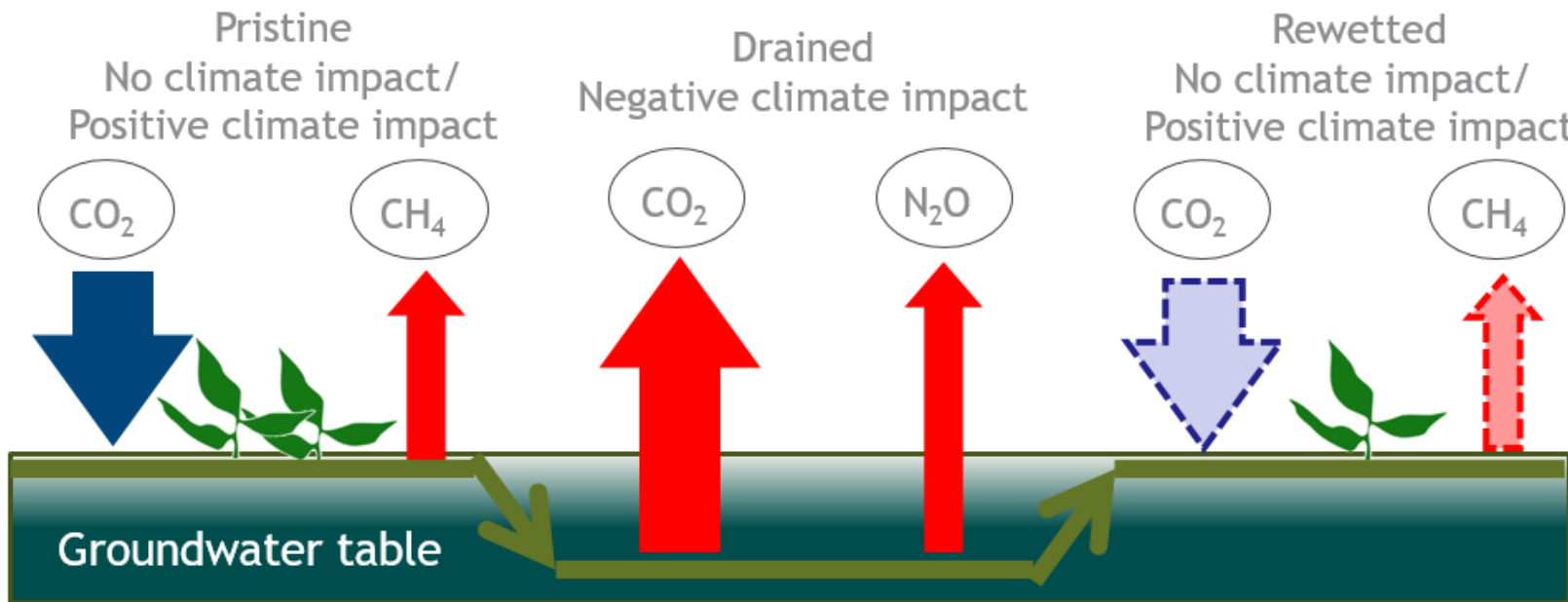


Background

- Peatlands play an important role in the global climate system
- Drainage for agricultural use (e.g., grassland) transforms peatlands from a C sink into C source.
- Rewetting might restore the C sink function of formerly drained peatlands



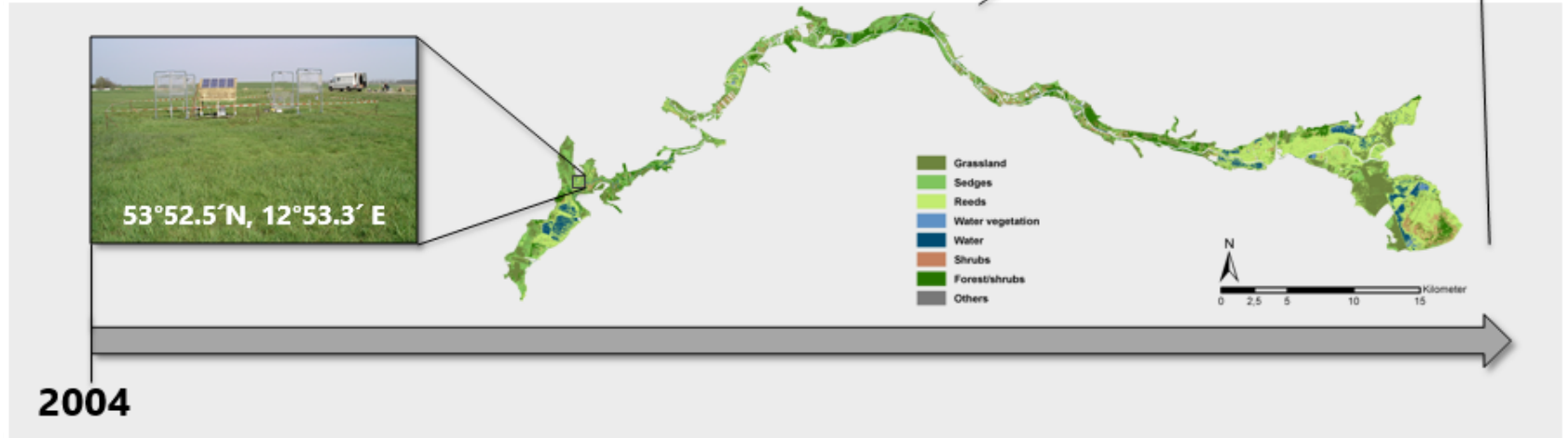
How long does it take to restore the C sink function?



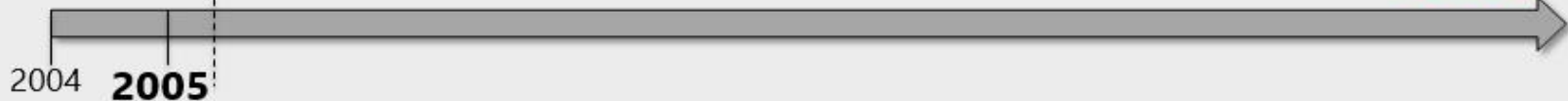
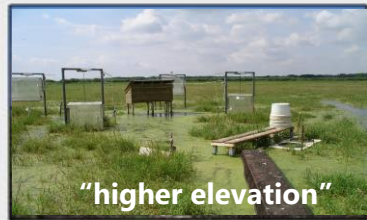
Study Site



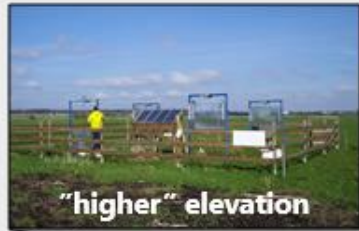
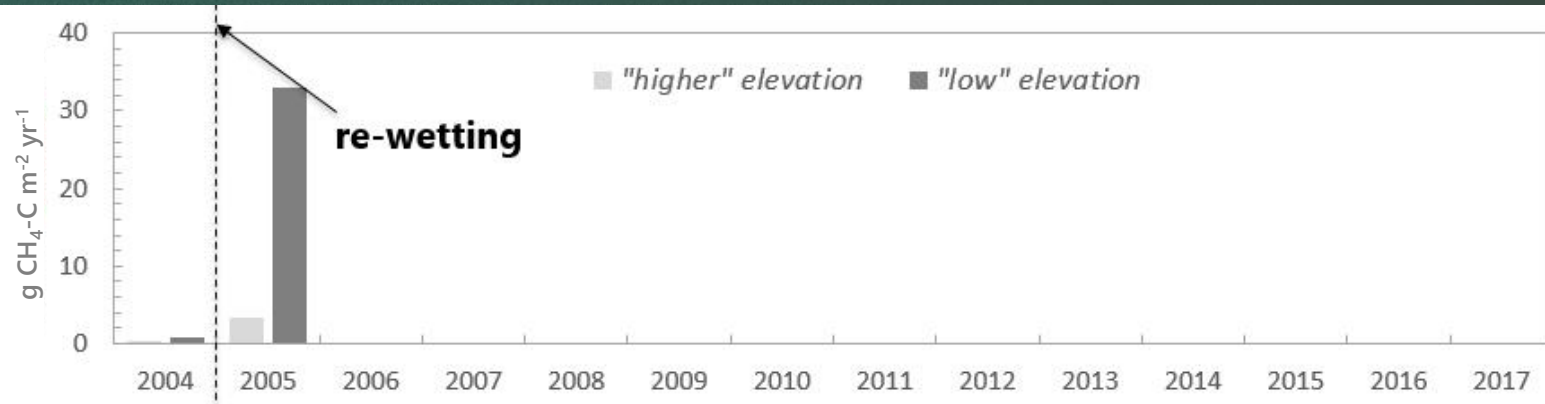
- Peene river valley, Mecklenburg-western Pomerania, NE-Germany (riverine mire (up to 10m peat depth))
- **Drained** and intensively agricultural used during 18th century
- **Rewetted** in 2005



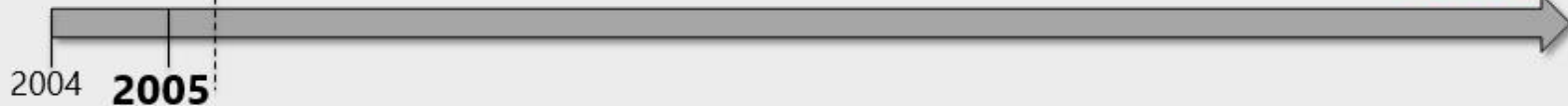
- Two measurement sites which differ in elevation
- Semi-humid grassland (\Rightarrow ***“higher” elevation***)
- Inundated grassland (\Rightarrow ***“low” elevation***)
- 13 years of NFT-NSS closed chamber measurements of CH_4 (n=5) following rewetting (+ 1 year prior rewetting)



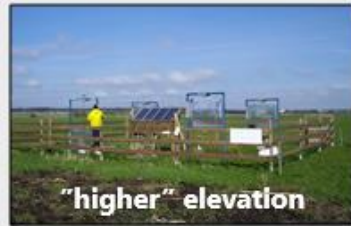
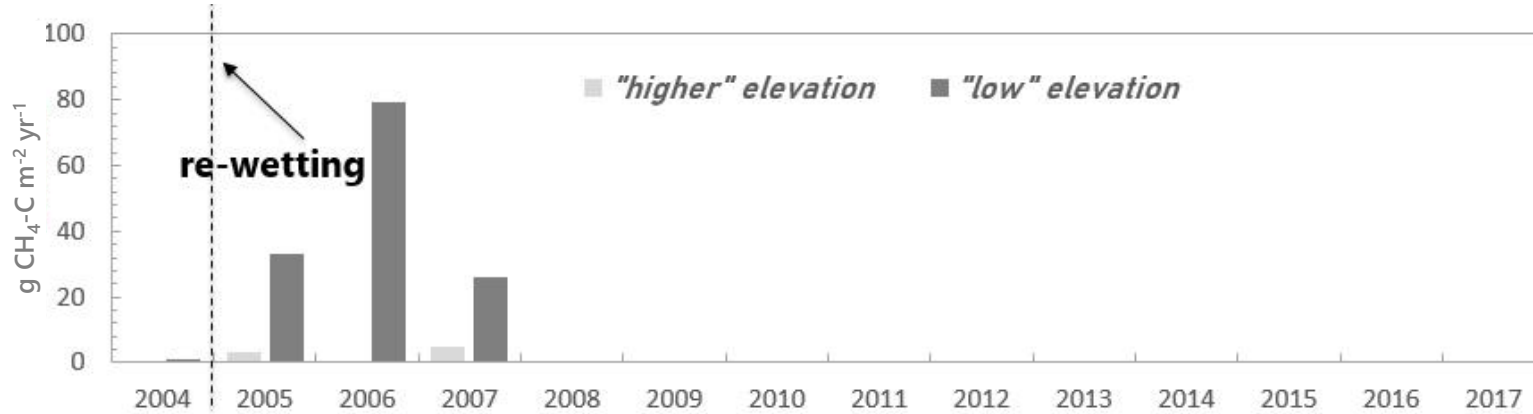
Results: high CH_4 emissions 1 year after rewetting!



20..?



Results: decreasing CH_4 emissions after 2 years!

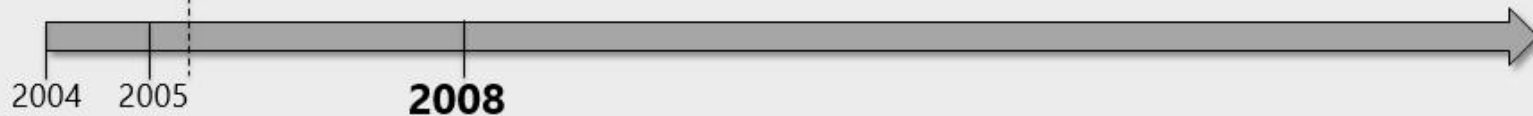


"higher" elevation

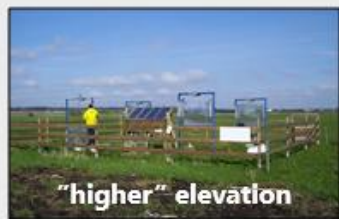
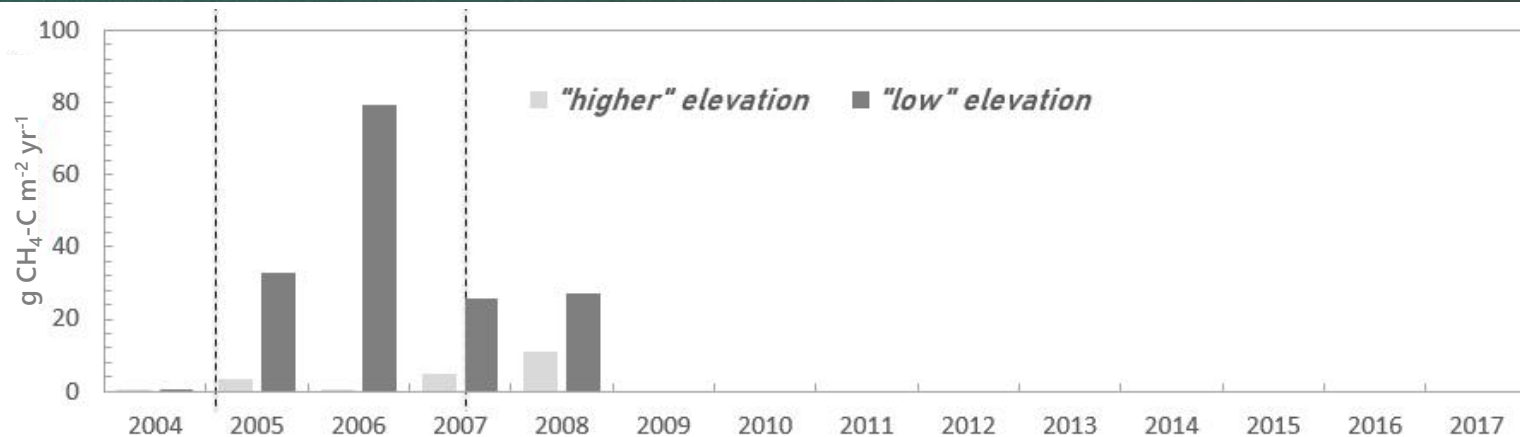


"low" elevation

20..?



Results: high CH_4 emissions after rewetting!

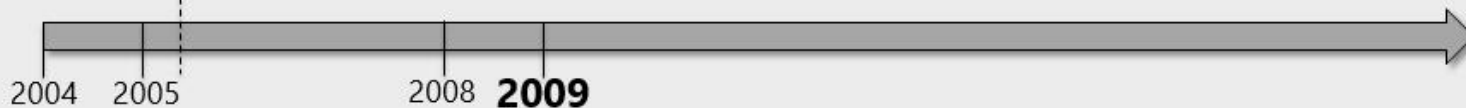


"higher" elevation

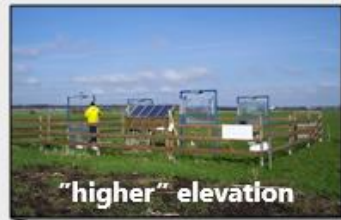
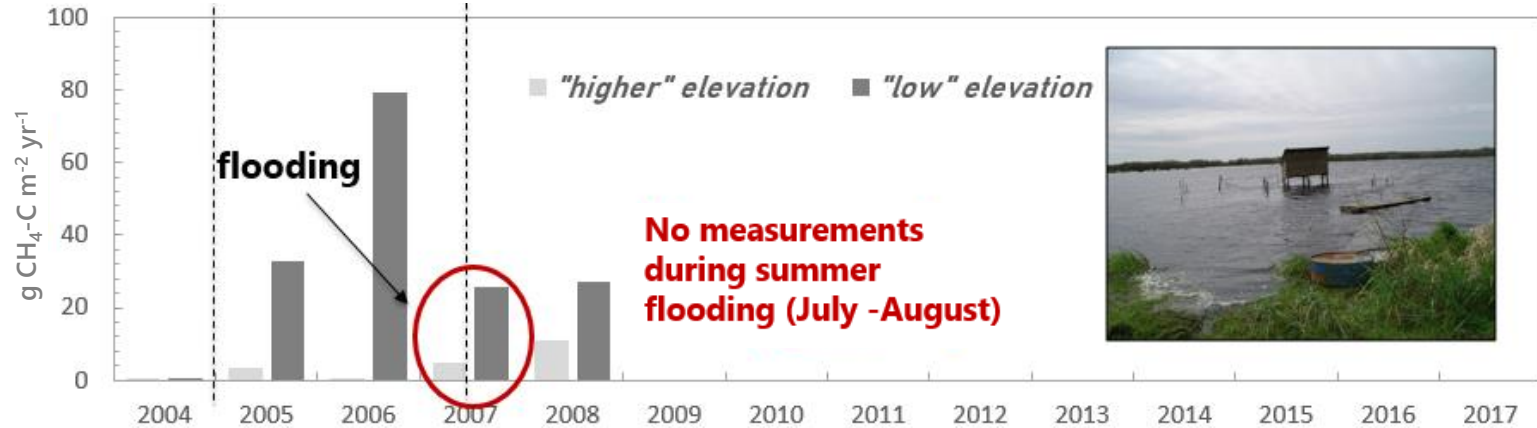


"low" elevation

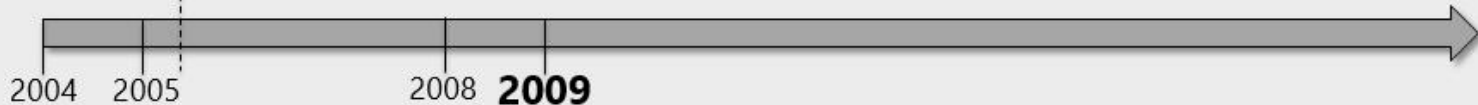
20..?



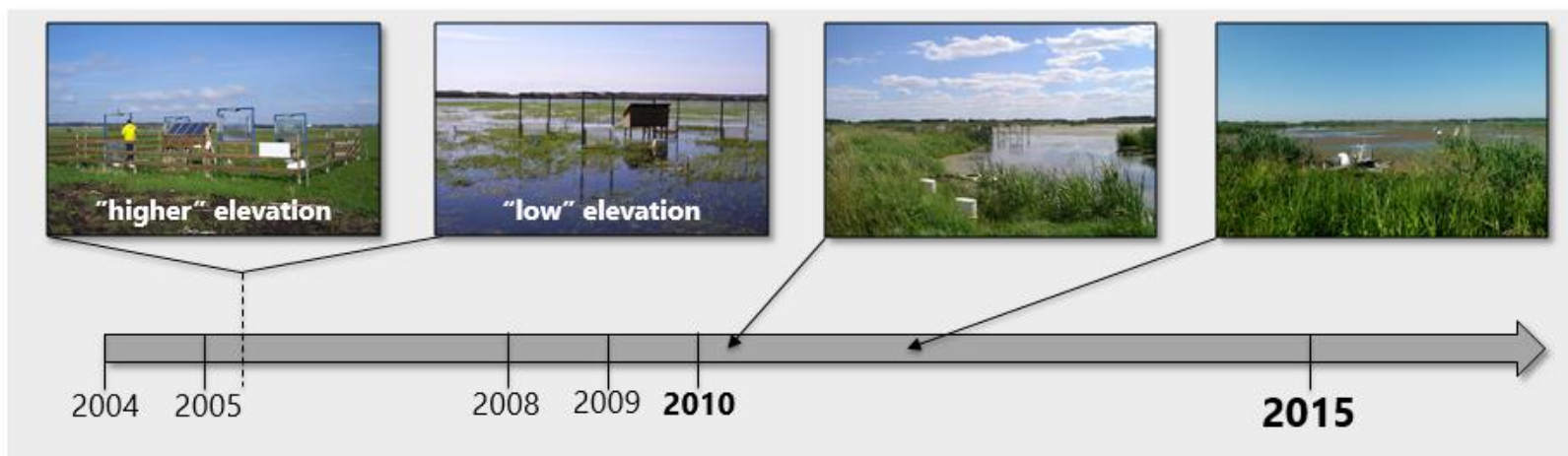
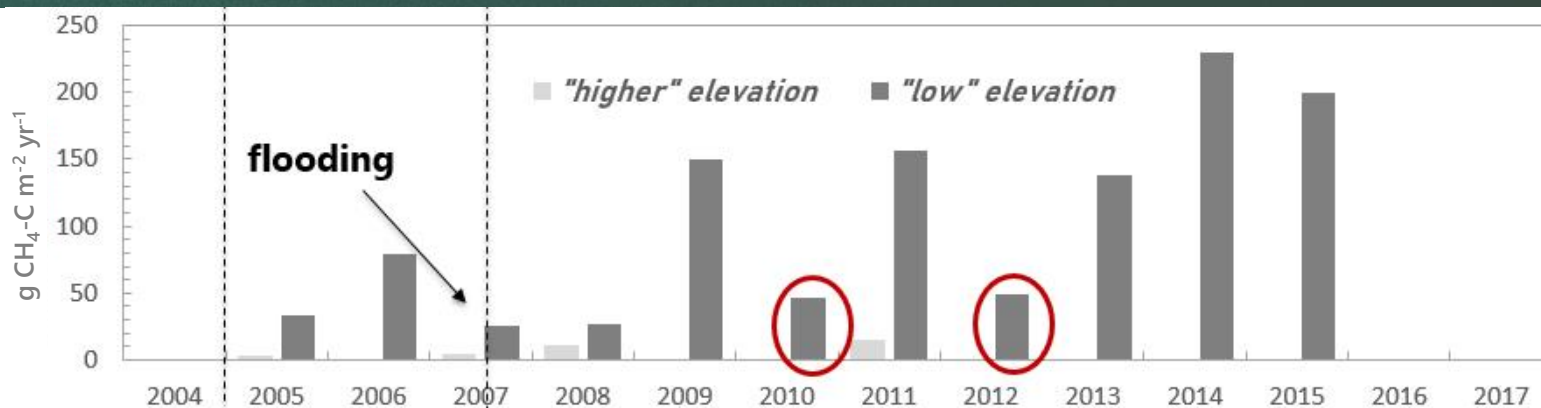
Results: high CH_4 emissions after rewetting!



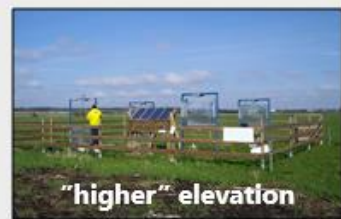
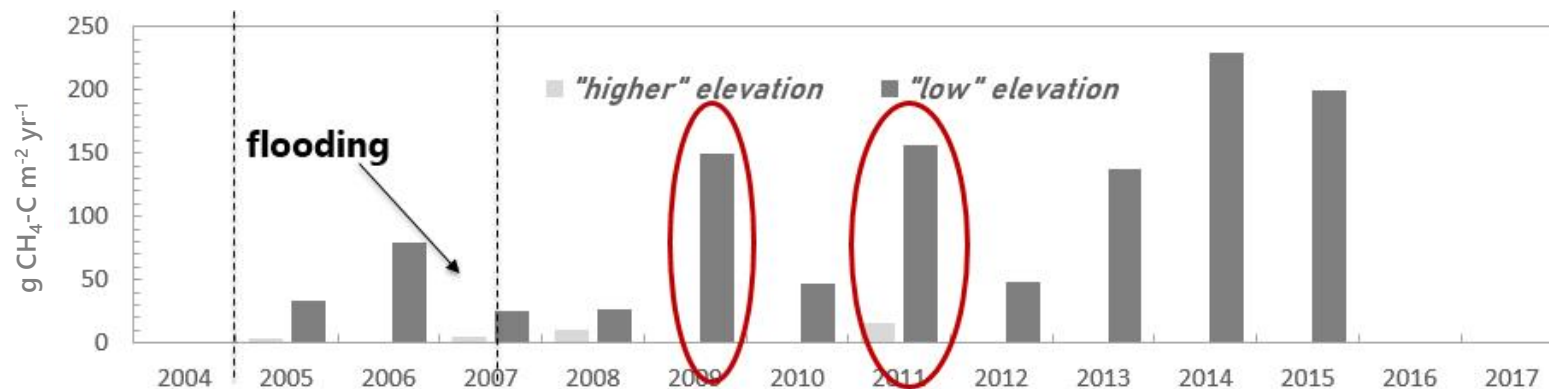
20..?



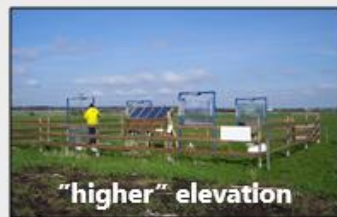
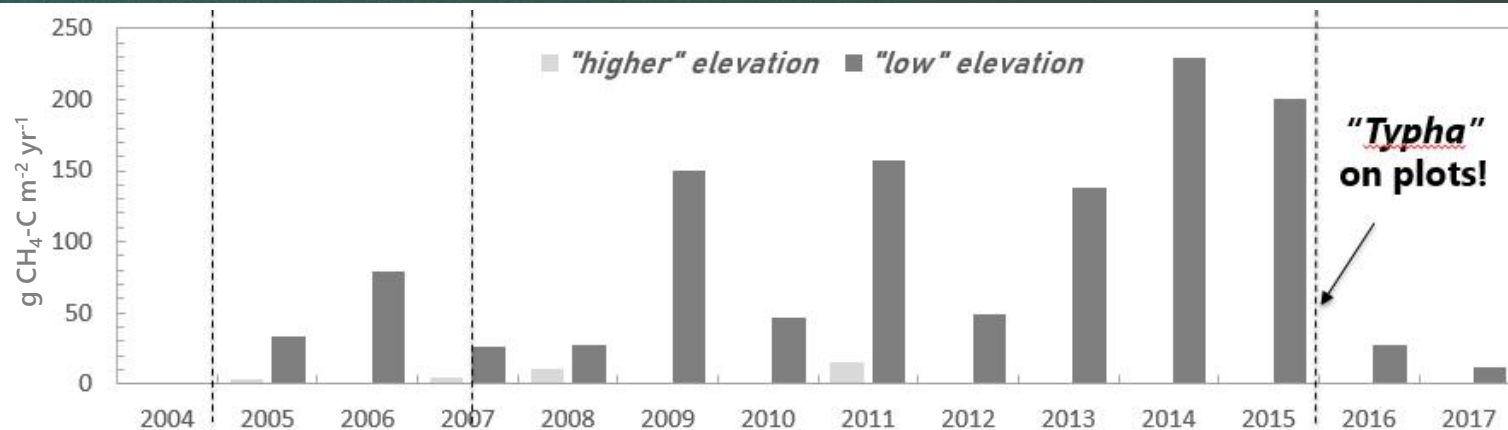
Results: remaining high CH_4 emissions!



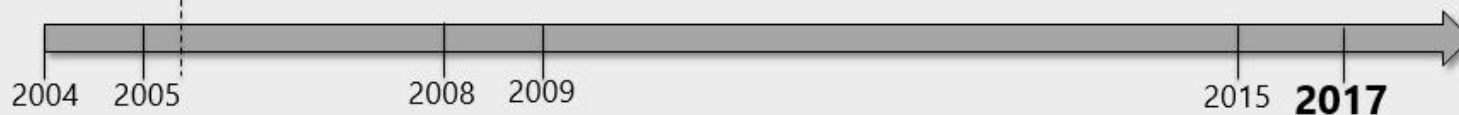
Results: remaining high CH_4 emissions!



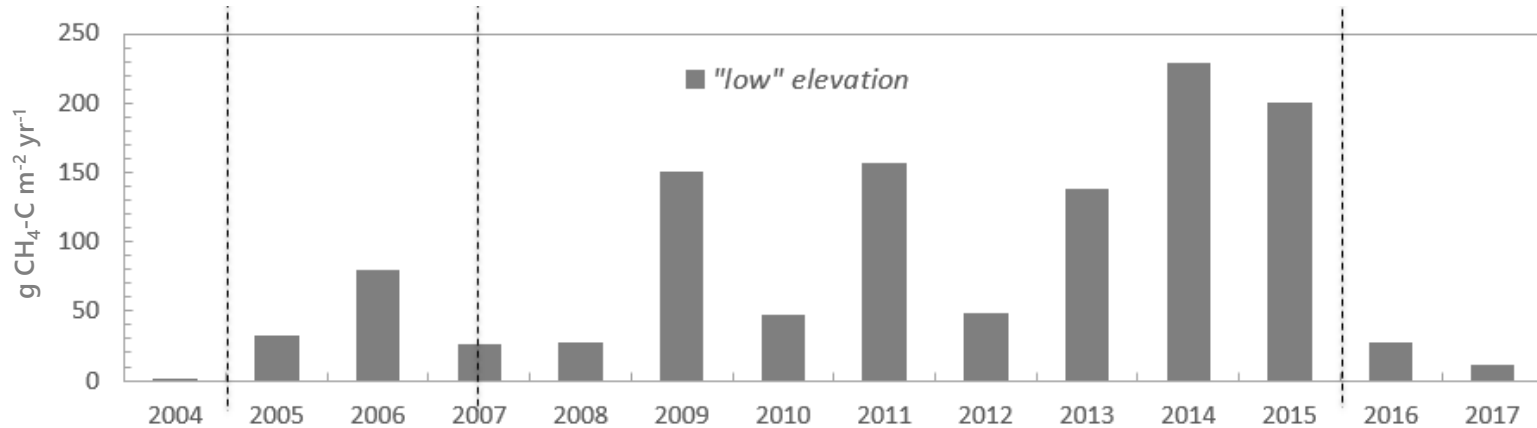
Results: decreasing CH_4 emissions!



2017!



Results: decreasing CH_4 emissions!



Before Flooding

Phalaris arundinacea

Floating

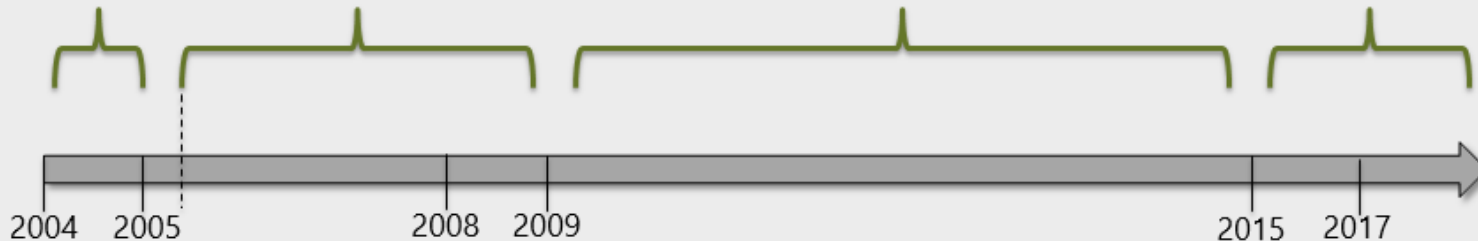
Lemna trisulca
Spirodela polyrrhiza

Submerged

Ceratophyllum submersum

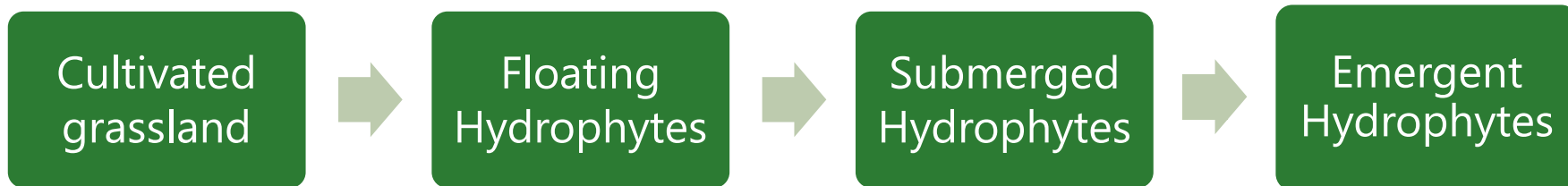
Emergent

Typha latifolia
Carex disticha



Conclusions

There is temporal vegetation shifts from:



- Initial stage after rewetting generates high CH_4 emission (creating open shallow lake)
- In the second stage, the shallow lake was colonised by floating and submerged hydrophytes which increases more stable CH_4 emission
- In the third stage, the emergent hydrophytes in marginal areas colonised the area and therefore substantial decrease in CH_4 emission in 2016/2017
- Hence, there is need for long term studies to cover long term transition

Thank you for your attention! Questions?



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