

# Effect of maintenance liming on growing-season N<sub>2</sub>O emissions in an arable soil of SE Norway

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**FACCE**  
**ERA-GAS**



MONITORING & MITIGATION OF GREENHOUSE GASES  
FROM AGRI- AND SILVI-CULTURE

**MAGGE-pH**

# Liming as a mitigation option



By liming, we could reduce mineral fertilization induced N<sub>2</sub>O emissions.



Liming is usually split into bulk and maintenance application.



Bulk application is applied first to the acidic soil, and maintenance follows bulk application few years after (or months) in order to maintain the target pH reaction of the soil.



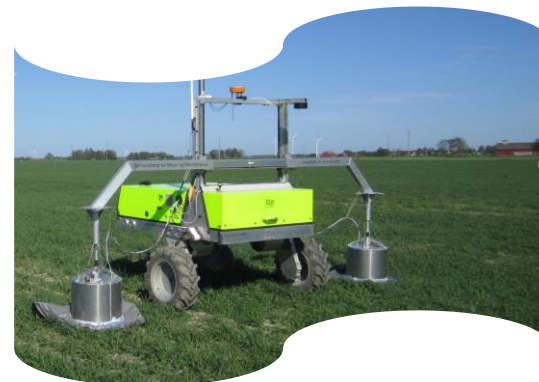
Does this re-application of lime reduce N<sub>2</sub>O emissions?

# Experimental site

- SE Norway
- Boreal climate, MAAT 7° C, MAP 1083 mm
- Perennial grassland which was ploughed under in autumn 2018
- In **2014 bulk lime** application, 30 t ha<sup>-1</sup> marble, olivine and 24 t ha<sup>-1</sup> dolomite
- In **2019 maintenance lime** application 1.7 t ha<sup>-1</sup> dolomite, 1.2 t ha<sup>-1</sup> marble and 5 t ha<sup>-1</sup> olivine

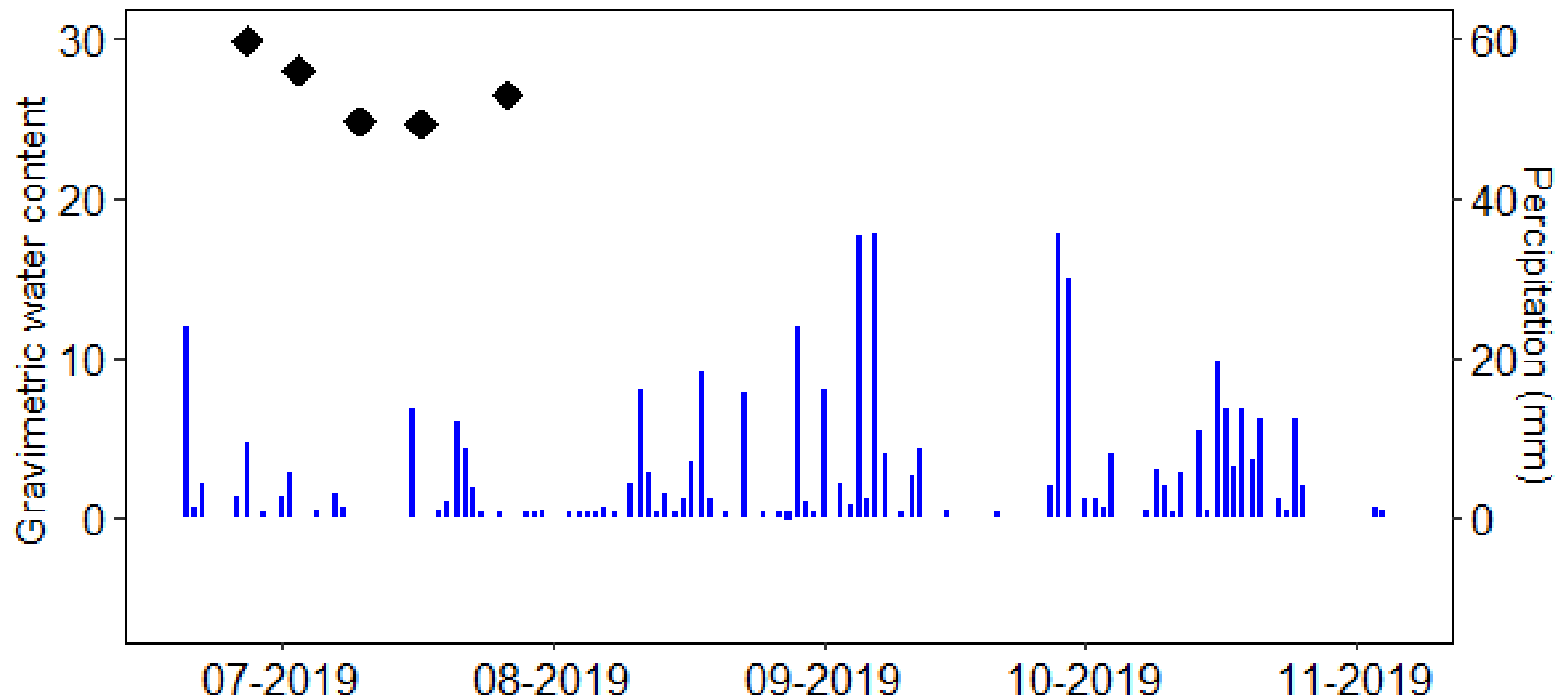


# Experimental layout

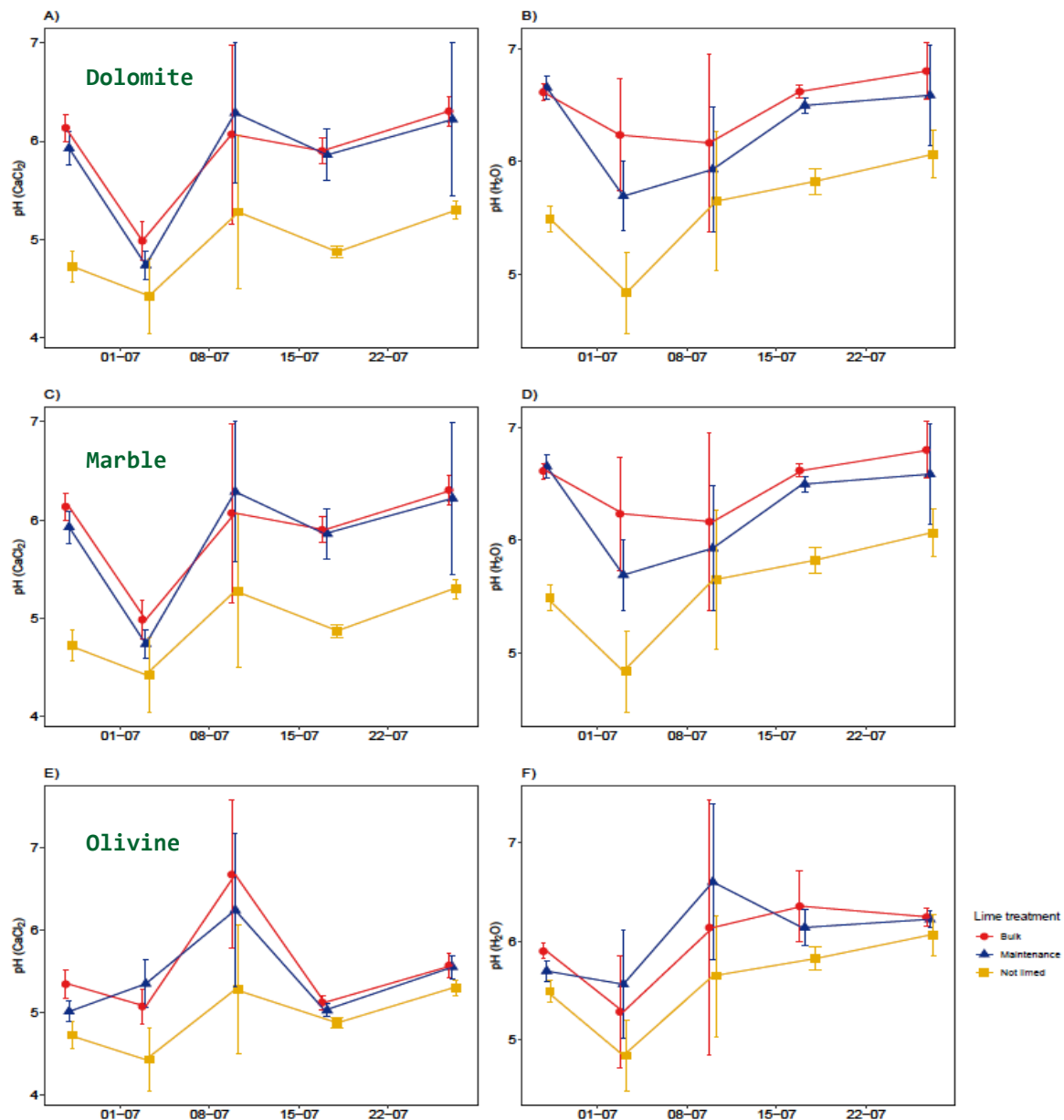


- Direct comparison of CO<sub>2</sub> and N<sub>2</sub>O fluxes
- Old and new limed next to each other in each plot (with only 4 min difference in time)
- Minimize spatial and temporal variability

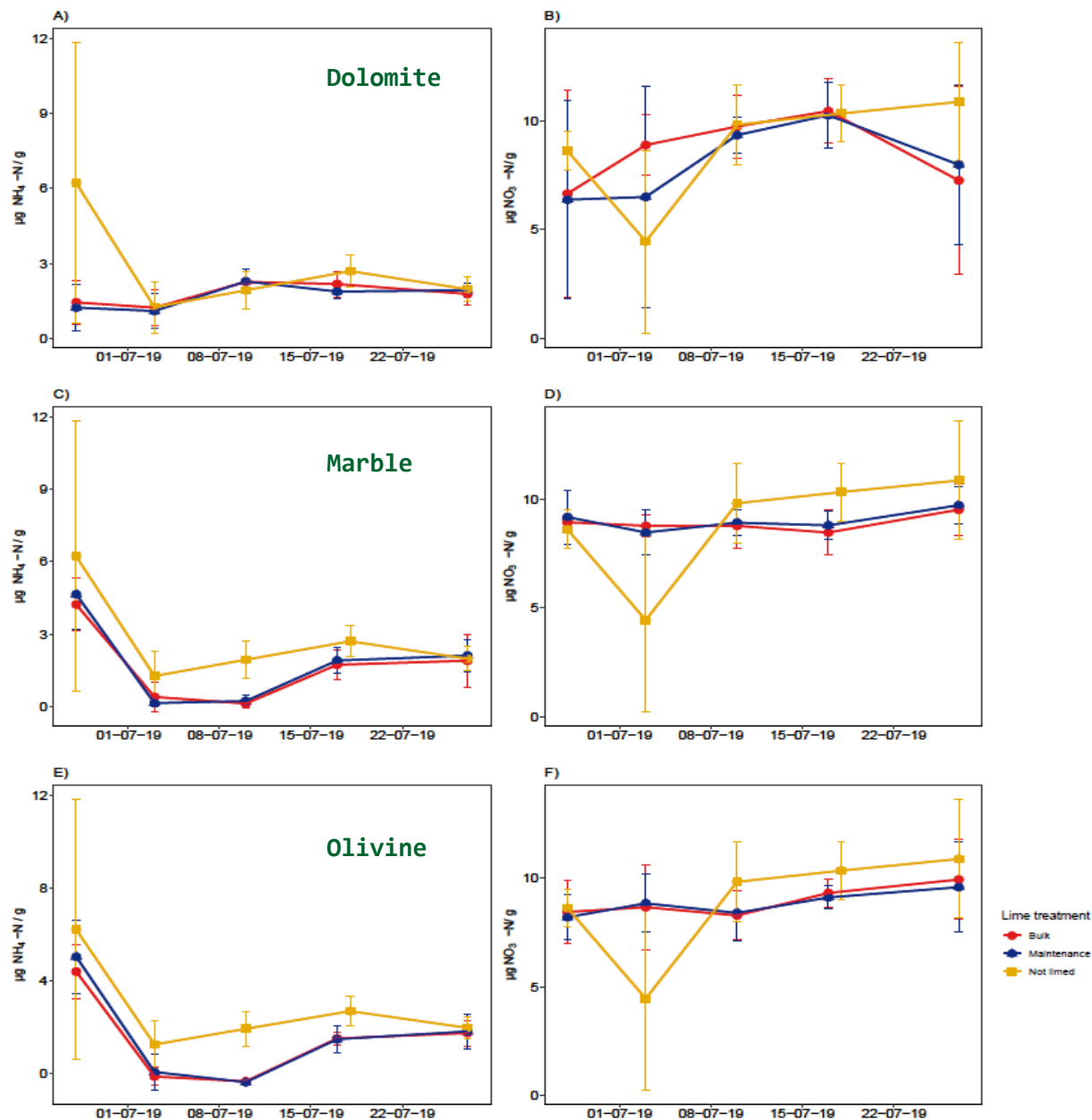
## Daily percipitation and average gravimetric water content



# Soil pH

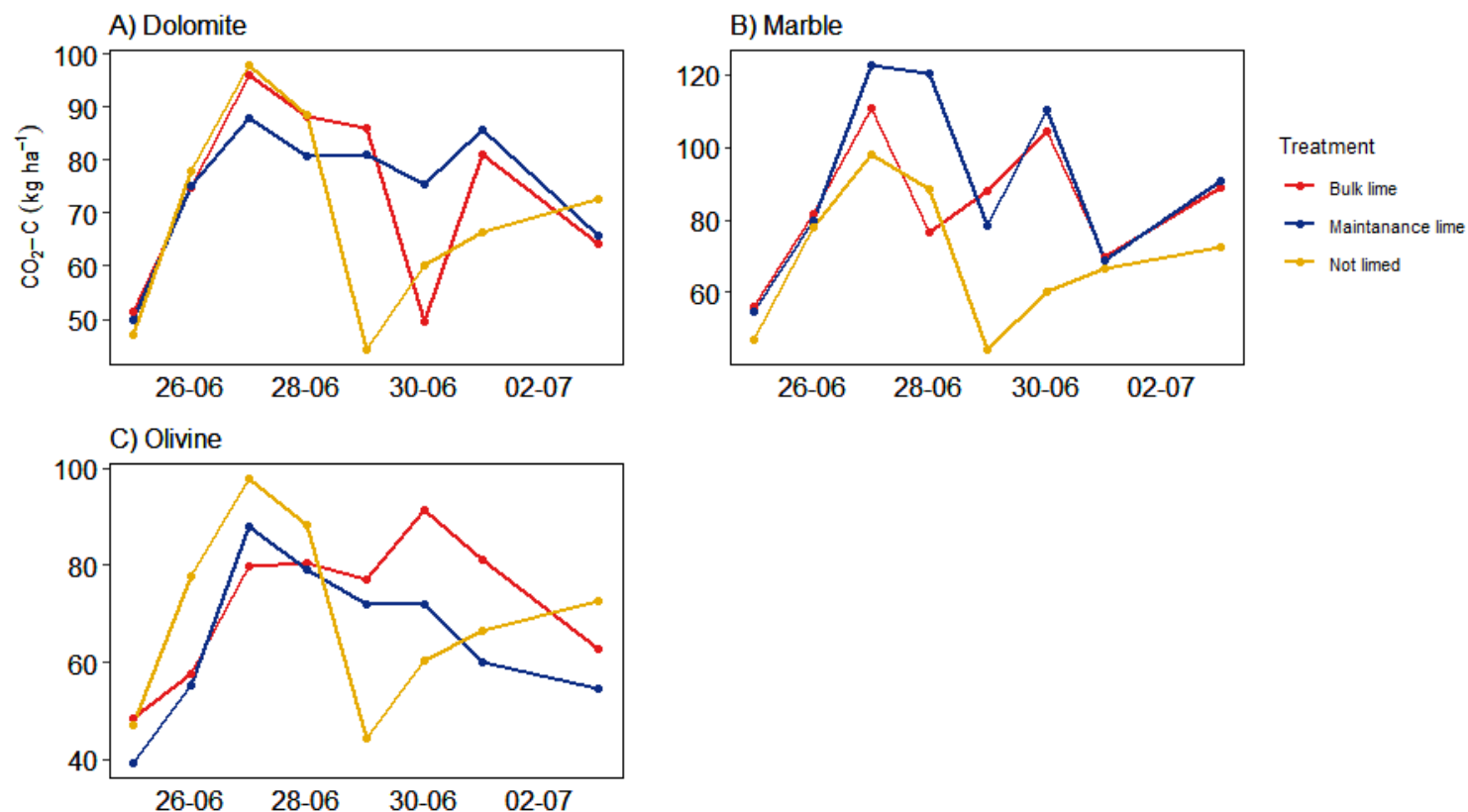


# Soil mineral N



# CO<sub>2</sub> emissions

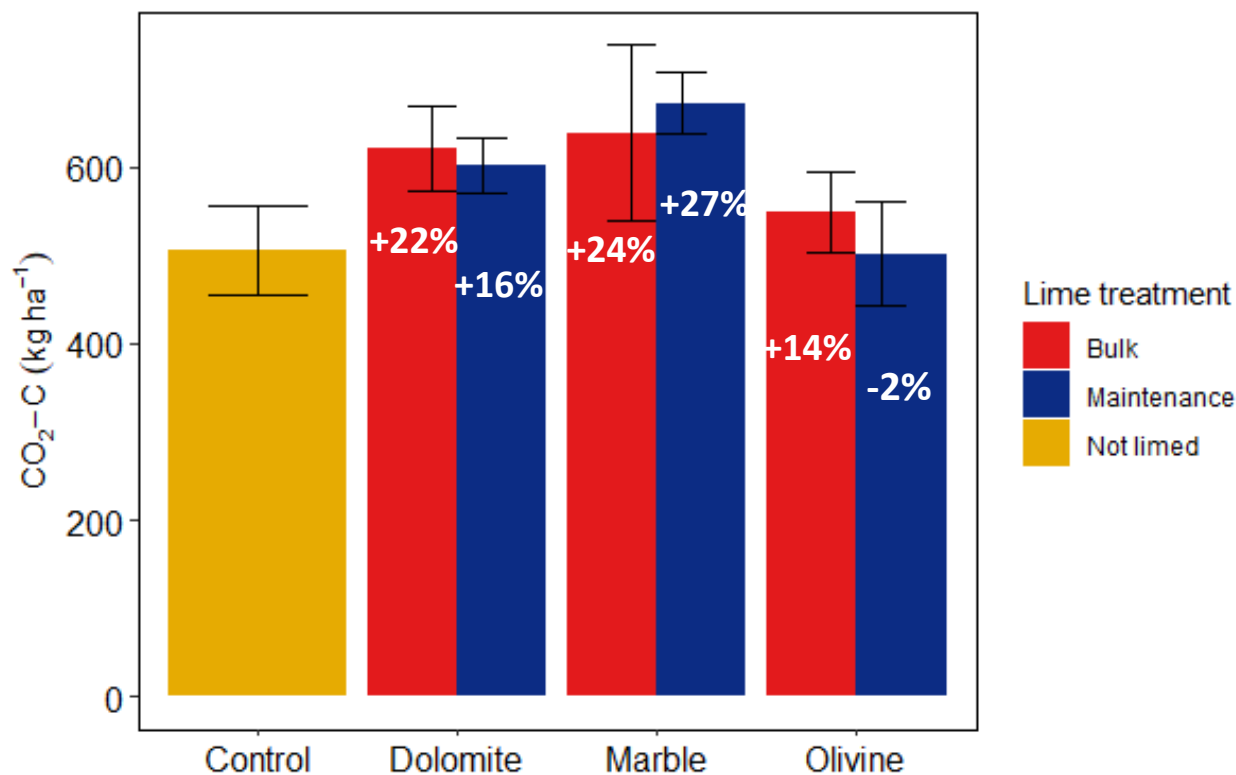
*Daily average fluxes (26<sup>th</sup> June to 5<sup>th</sup> July 2019)*





# CO<sub>2</sub> emissions

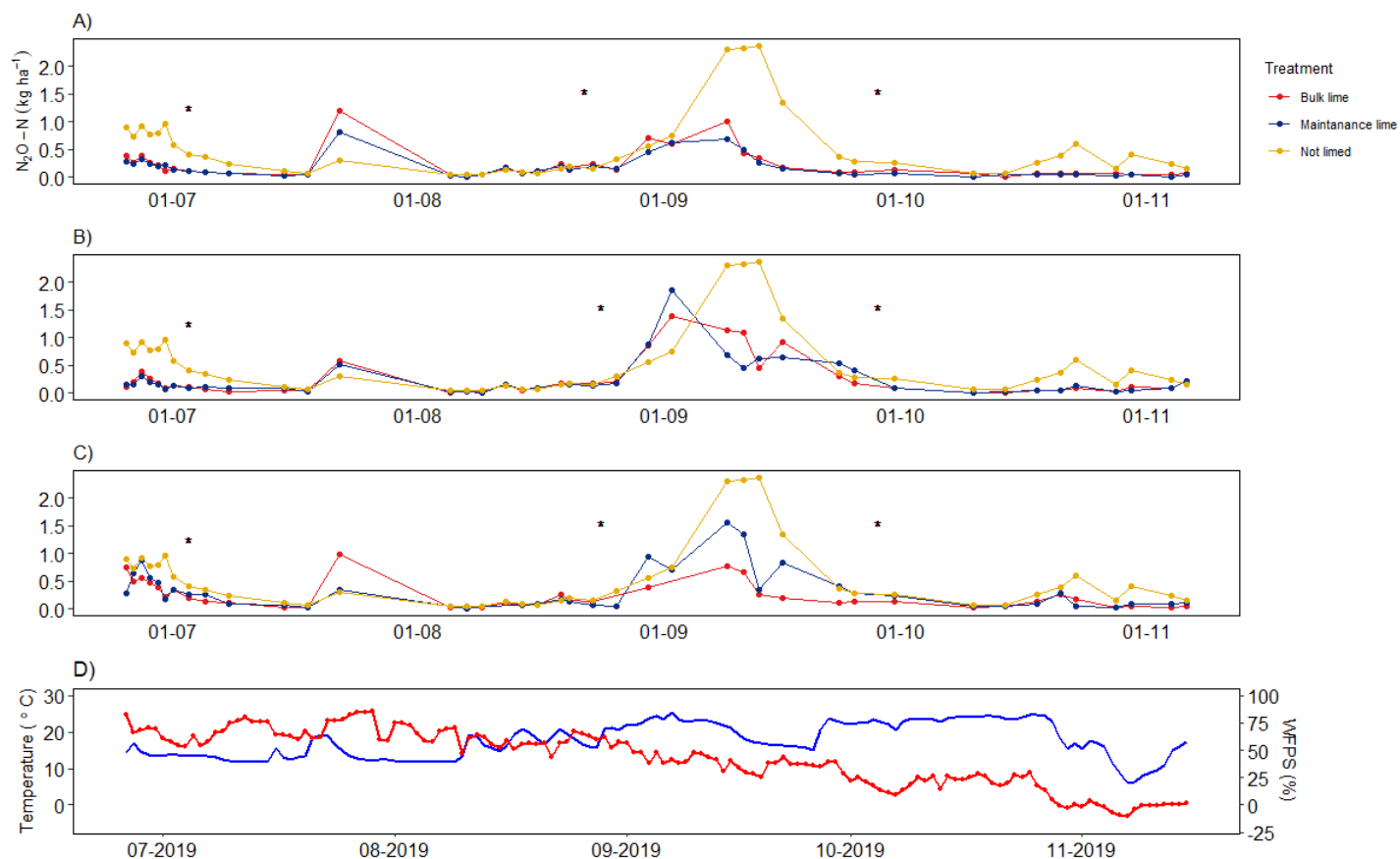
*Cumulated (26<sup>th</sup> June to 5<sup>th</sup> July 2019)*



No significantly higher CO<sub>2</sub> emissions compared to control for cumulated period

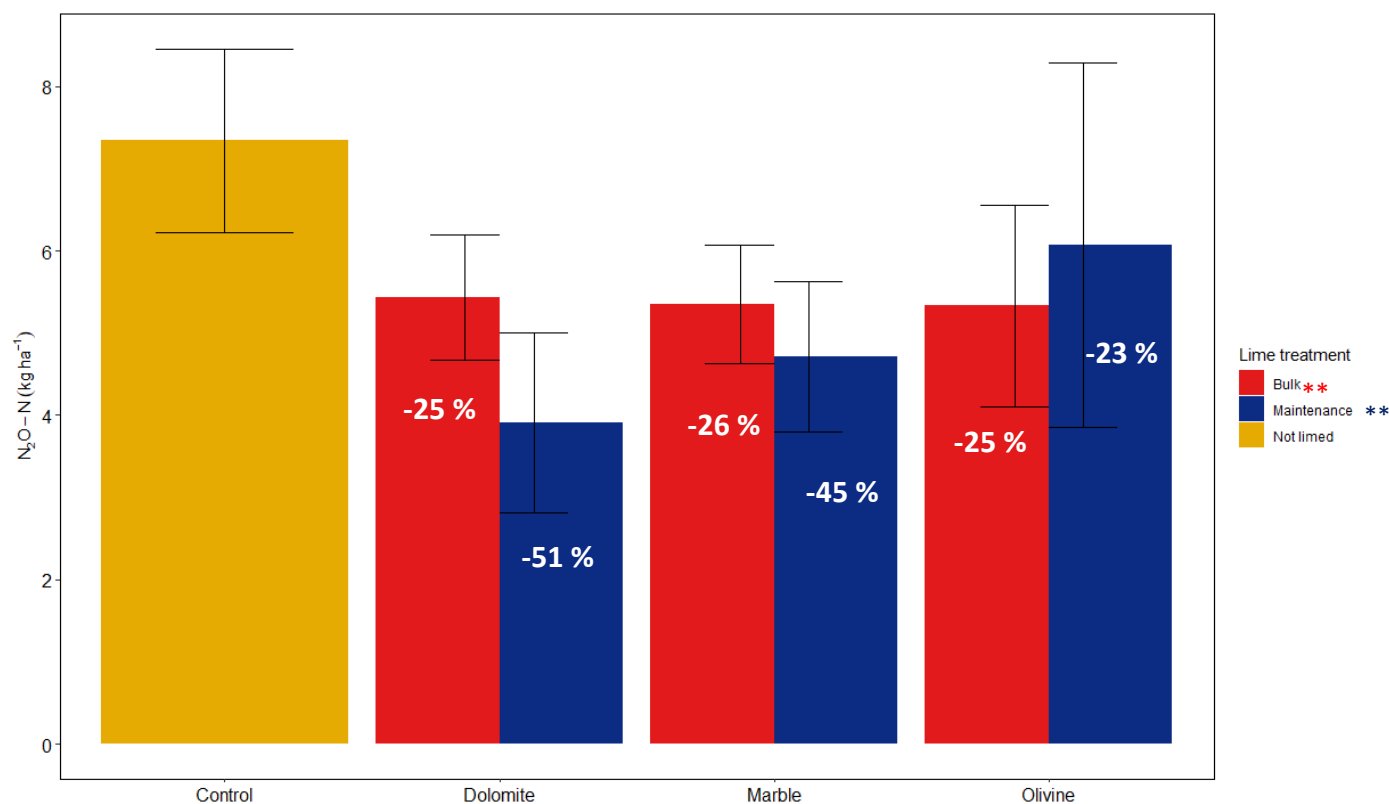
# N<sub>2</sub>O emissions

*Daily average fluxes (26<sup>th</sup> June to 6<sup>th</sup> November 2019)*



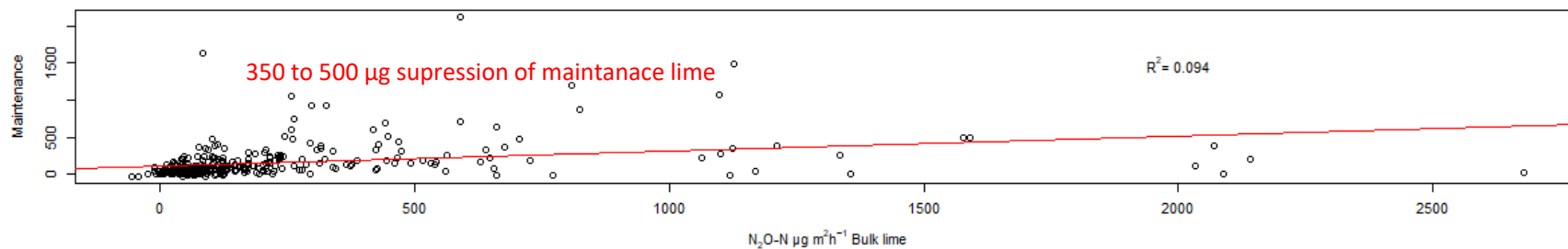
# N<sub>2</sub>O

## *Cumulated emissions (26<sup>th</sup> June to 15<sup>th</sup> September)*

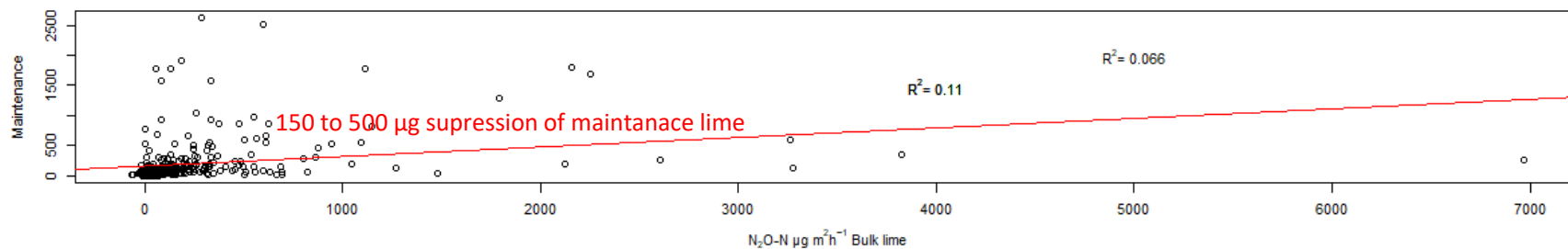


# $N_2O$ «*emission treshhold*»

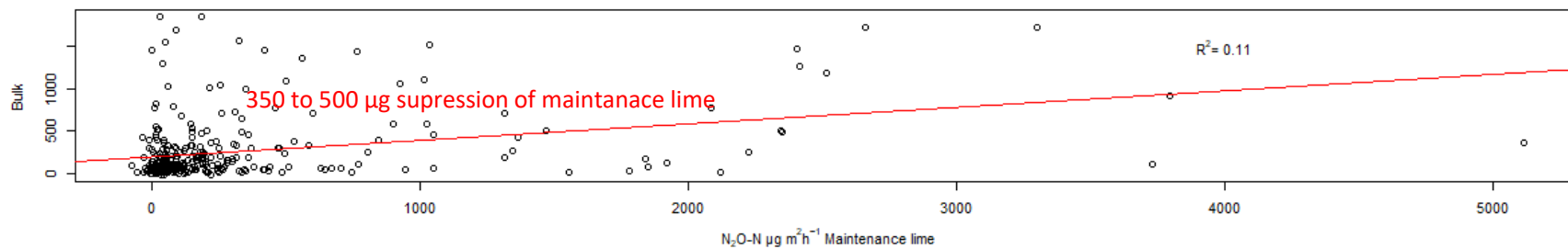
Dolomite



Marble



Olivine



# Conclusion

- No statistical difference between bulk and maintenance lime on N<sub>2</sub>O reduction
- Compared to control ( $p < 0.05$ ) both maintenance and bulk have significantly reduced N<sub>2</sub>O emissions
- Maintenance lime suppresses the high fluxes
- No significantly higher CO<sub>2</sub> emissions compared to control for cumulated period and during the whole campaign, but should be repeated on bare soil
- Big potential: continuing reduction of N<sub>2</sub>O after 5 yrs of application and highest up «*just*» 27% increase in CO<sub>2</sub>



Thank you!