

## Greenhouse gas emissions of European croplands

#### **Matthias Kuhnert<sup>1,\*</sup>**, Michael Martin<sup>1</sup>, Adrian Leip<sup>2</sup>, Matthew McGrath<sup>3</sup>, and Pete Smith<sup>1</sup>

1 University of Aberdeen, Institute of Biological and Environmental Sciences, School of Biological Science, Aberdeen, UK; 2 Joint Research Centre, Via E. Fermi, 2749 I-21027 Ispra, Italy; 3 Laboratoire des Sciences du Climat et de l'Environnement, UMR 8212 CEA-CNRS-UVSQ,91191 Gif-sur-Yvette CEDEX, France

\*Coresponding author: matthias.kuhnert@abdn.ac.uk













#### Aims

- Generate input data (phenological data and management information)
- Simulate heterotrophic respiration for Europe croplands (2006-2015)
- Simulate soil organic carbon (SOC) changes for 2006-2015



### Methods

- Simulations with ECOSSE model
- Soil data from the HWSD data set
- Using the climate data in a ~10 km resolution



### Methods



Figure 1: Sowing and harvest dates are calculated for each year using the temperature of the climate data set. The management practice is set around these dates (fertilizer application a day before sowing and two weeks after; tillage two weeks after harvest).



# Results – European average respiration



Figure 2: The simulated respiration versus the values estimated by Ciais et al. (2010). These first results indicate a strong overestimation of the respiration.



### Results- heterotrophic respiration



Figure 3: Respiration rates vary strongly among the different years. SOC content is not the main driver.



### Results- heterotrophic respiration



Figure 4: Respiration rates are highest for areas with high SOC.



#### **Results - SOC**

Figure 5: SOC and SOC changes for Europe. SOC is decreasing during the target period (2006-2015). Areas with high SOC content show larger losses than other areas.





#### Discussion

- Respiration is still too high
- The western coasts show highest emissions (due to precipitation pattern)
- The extreme years 2006 and 2008 show higher emissions
- Further analysis is needed



#### **Questions: matthias.kuhnert@abdn.ac.uk**



https://verify.lsce.ipsl.fr/

Twitter: @V\_ERIFY\_H2020