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The good land, the bad use and the ugly CO₂ - a look at land use changes in the past

Before we begin
...did you know

... that human activities, such as land use change, are causing fluctuations in atmospheric CO₂?
... that the Anthropocene possibly started - 6050 AD, when land use change in atmospheric CO₂ began?

...that the CO₂ impact in the past can be measured?

regional scale

global scale

pollen analysis
stromatal frequency analysis

ice core records
climate and demographic models

The Beginning of the Anthropocene

WHAT?

abnormalities in the CO₂-level occurred after the last interglacial.

LAND USE

human population increased and land use consisted of clearance of forest patches.

CONSEQUENCES

due to clearance CO₂ stored in the vegetation, entered the atmosphere.

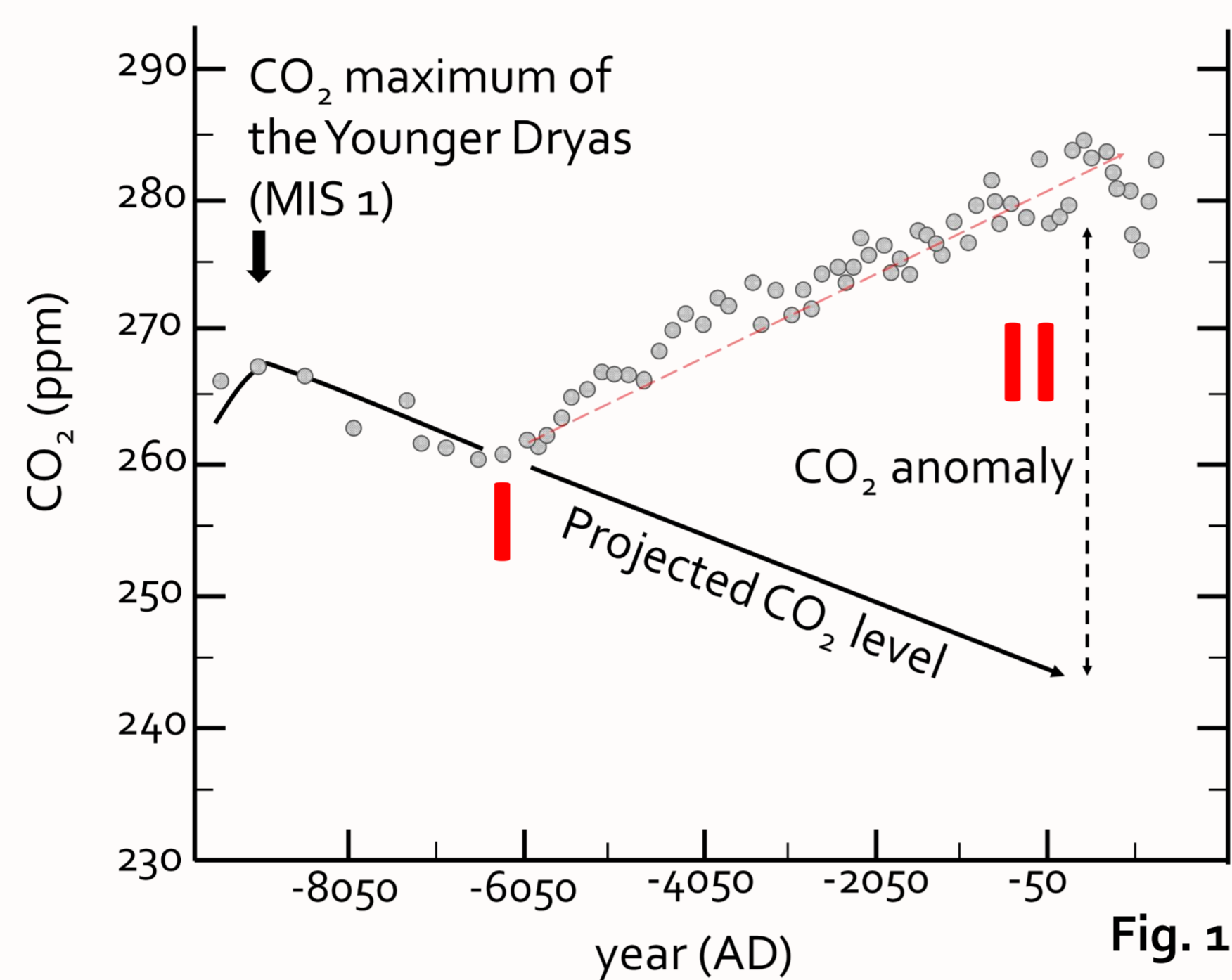


Fig. 1

Fig. 1: measured CO₂ concentration in Antarctic ice cores (dots). In comparison, projected CO₂ levels based on previous interglaciations (curved arrow). Graph modified and simplified after Rudimann (2003). MIS = marine isotope stages.

The Black Death in Europe

WHAT?

agricultural crisis caused malnutrition and vulnerability to diseases.

LAND USE

farmland was abandoned as 30 to 45% of the population died due to the plague.

CONSEQUENCES

CO₂ bound in the re-established vegetation, allowed a regional decrease in the CO₂ content.

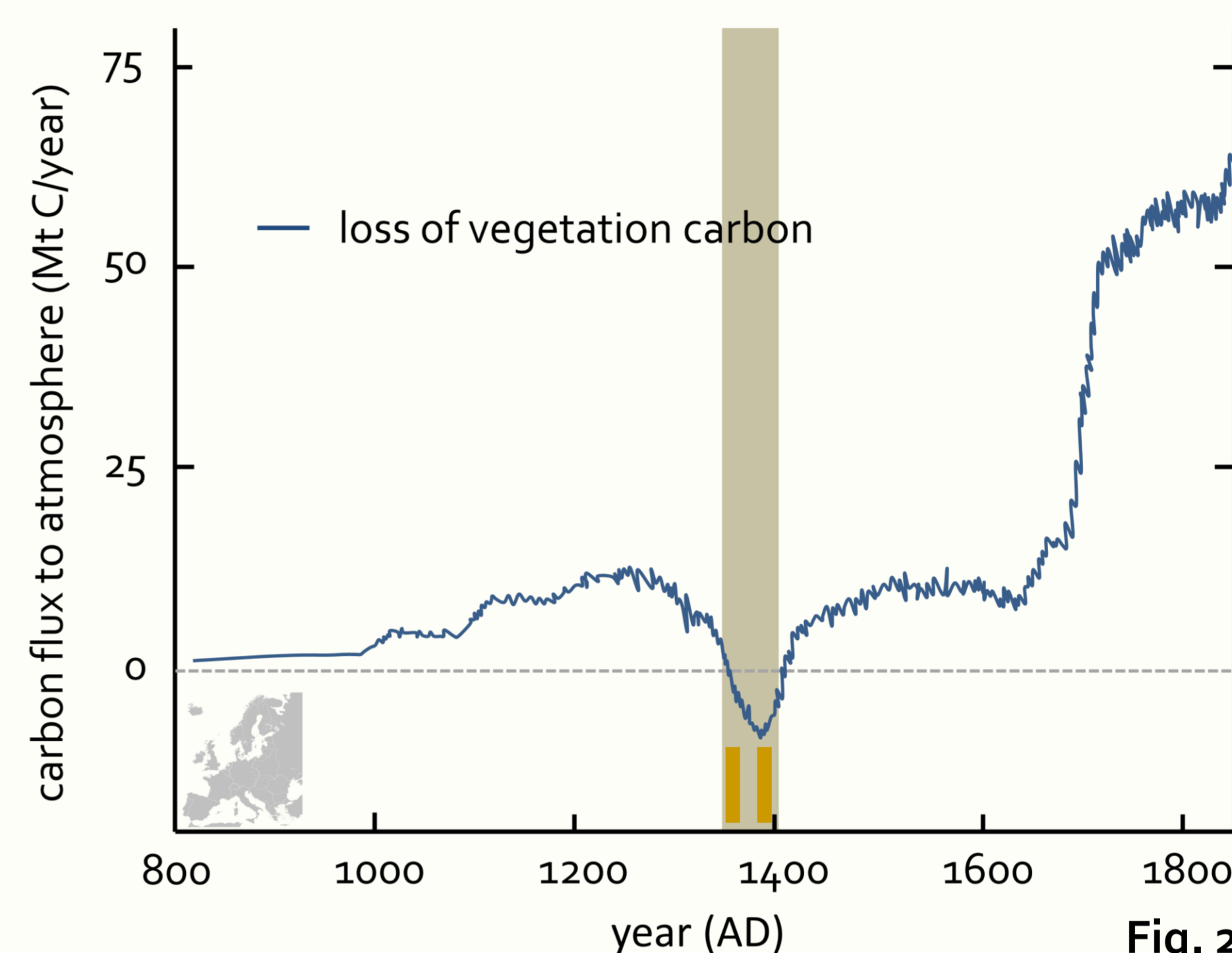


Fig. 2

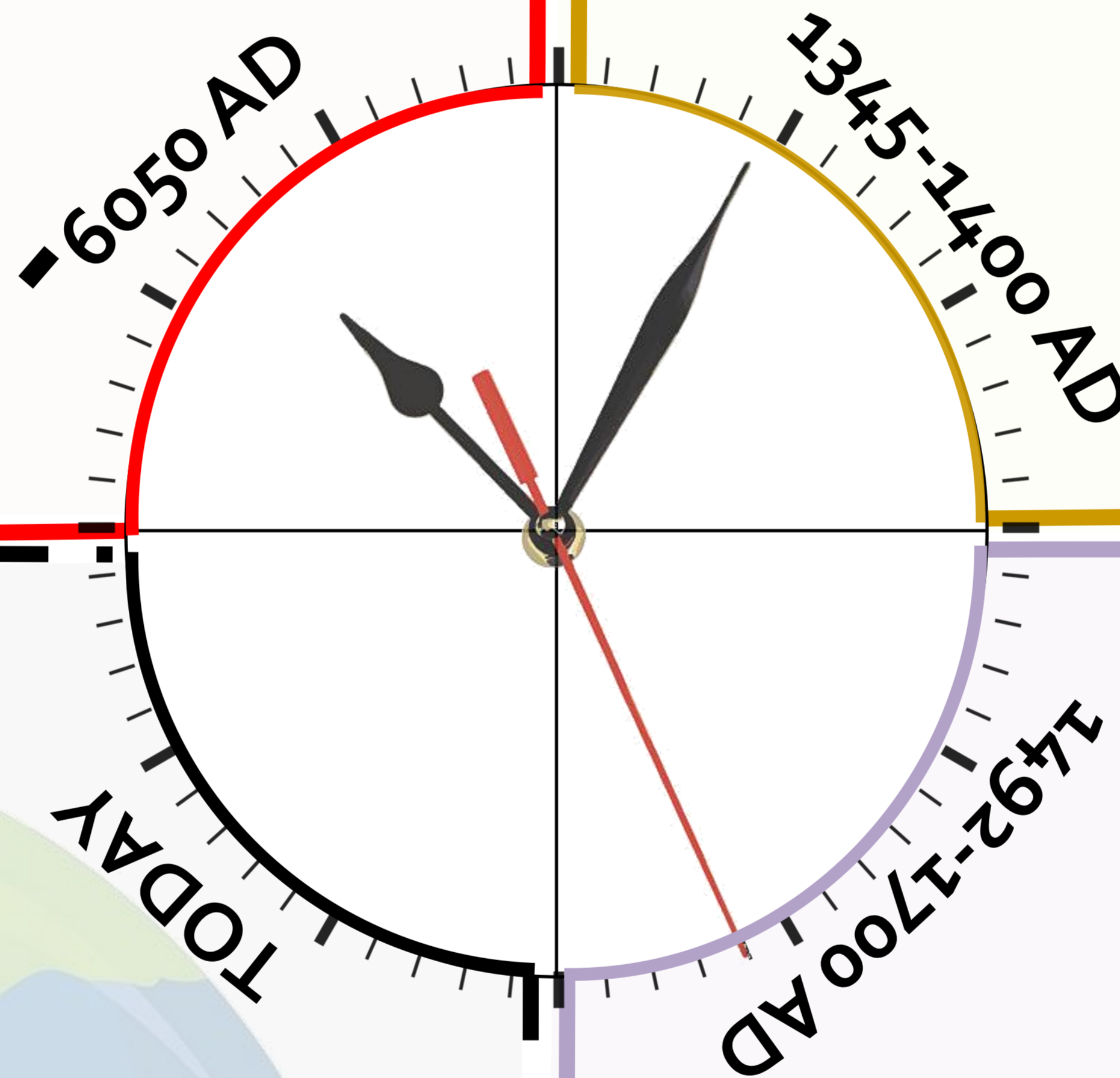
Fig. 2: loss of vegetation carbon in Europe since 800 AD. Increase in vegetation carbon during the Black Death in Europe (green column) leads to a decrease of total carbon flux to the atmosphere. Modified and simplified after Pongratz et al. (2011).

Current situation

At present, half of the earth's terrestrial surface is altered by land use.

Since -6050 AD the CO₂ in atmosphere has risen from ~260 ppm to ~400 ppm.

We are still living in the Anthropocene!



The Conquest of the Americas

WHAT?

90% of the indigenous people died due to murder and epidemics by the Europeans

LAND USE

fast regrowth of the forest biomass, due to large scale abandonment of agricultural areas.

CONSEQUENCES

decrease in atmospheric CO₂ over the following 200 years.

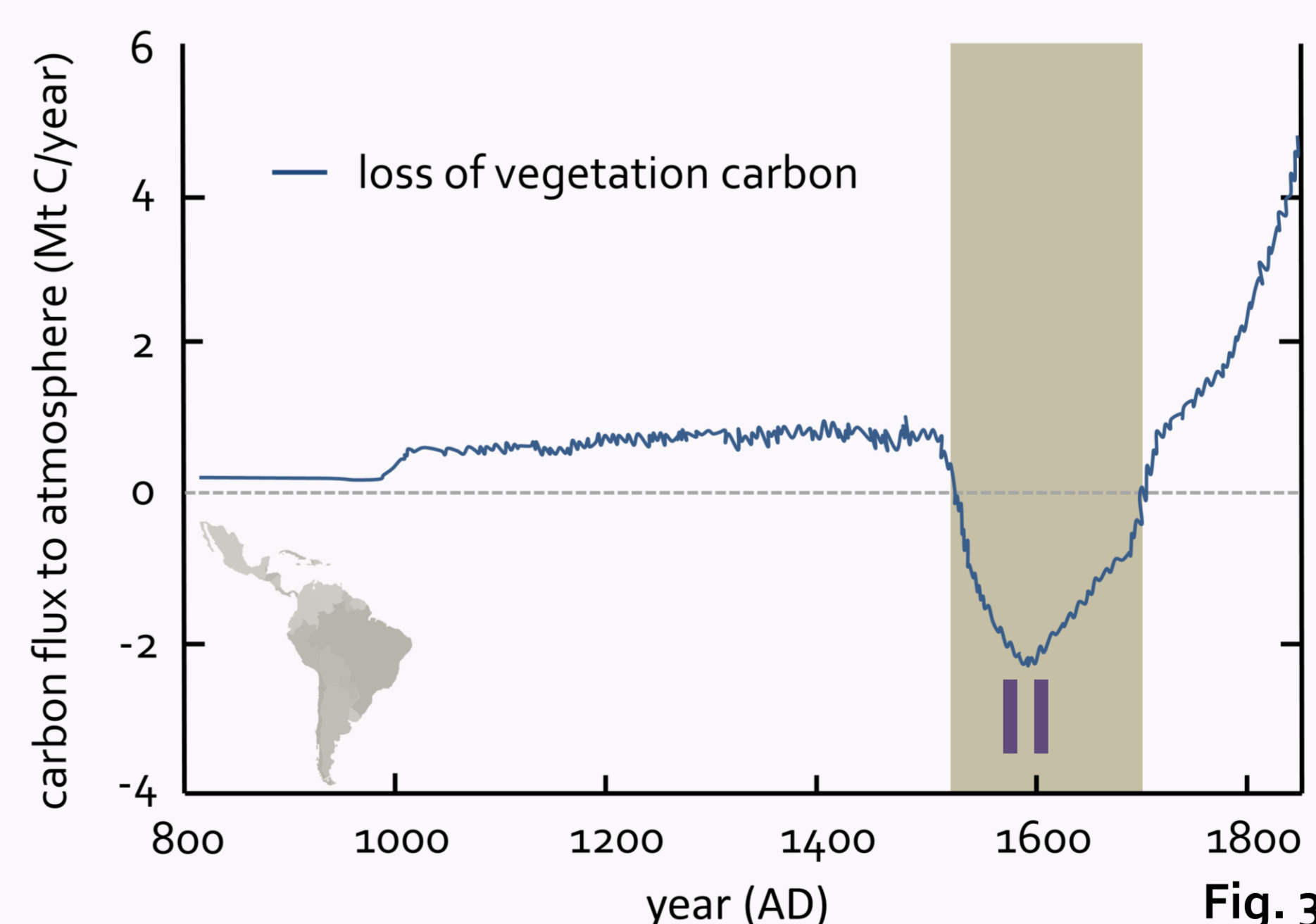


Fig. 3

Fig. 3: loss of vegetation carbon in South and Central America since 800 AD. Increase in vegetation carbon during the Conquest of the Americas (green column) leads to a decrease of total carbon flux to the atmosphere. Modified and simplified after Pongratz et al. (2011).

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