

Response to Anonymous Referee #2

We gratefully thank the referee for his/her constructive comments and have revised the manuscript accordingly. In our response below, referee comments are shown in black, our response in blue.

General Comments:

This manuscript explored the controlling factors for SOC stability and temperature sensitivity of its decomposition in agricultural terrace soils. The result is interesting and has a value for evaluate SOC stability under man-made landform. The manuscript falls into the scope of BG, although the Introduction and Discussion sections need to be improved.

Reply: We gratefully thank the referee for these positive and constructive comments. We have identified two main suggestions raised by the referee 1) Introduction is too long and need to be reorganized; 2) the logical thread of the discussion part is not so clear. We will re-work our Introduction and Discussion in the revised manuscript as follows:

Introduction is generally too long, and should be reorganized. The first paragraph was to show the significance of “SOC stabilization mechanisms and temperature sensitivity in terraced soils”, and then What’s the factors influenced SOC stabilization mechanisms and temperature sensitivity, ... terraced soils affected can vary which factors.... aim of this study? ...what’s your hypothesis...and finally add a sentence or two about the research expectations or significance in the end? Authors excessively cleared the well-known organic dynamic mechanisms; therefore, the relative information should be simplified.

Reply: We agree that the Introduction is a bit too long and need to be reorganized. We will rewrite the paragraph and the main revisions will be: 1) we will reduce the text about the well-known SOC stabilization mechanisms, e.g., introduction of SOC physical and chemical protection mechanisms (in Line 49-58); 2) We will reorganize the introduction as suggested by Referee. First paragraph will be a brief introduction of agricultural terraces and a short review about the current studies on SOC dynamics in terrace systems. At the end of this paragraph, we will point out the understudied question: understanding of SOC stabilization mechanisms in the agricultural terrace system. Second paragraph we will talk about two potential mechanisms (i.e., soil redistribution and SOC burial) that may affect SOC stabilization in terraces, and highlight the importance of mechanistic understanding of SOC stabilization mechanisms in assessing the role of terracing in terrestrial SOC cycle. Third paragraph we will talk about the significance of SOC temperature sensitivity study in evaluating the future warming-induced changes in terrace SOC stock. We will then review the potential controlling factors (e.g., SOC protection and quality) on SOC temperature sensitivity and formulate our research hypothesis: ‘the terrace age is a fundamental driver of evolution of soil geochemical properties, which in turn determines the SOC protection and quality thus SOC stabilization and temperature sensitivity’. Last paragraph is about the significance of this research and specific research objectives.

Line 170-174, Delete the sentences “Soil C:N ratio... of the substrate (Soares & Rousk, 2019)”, the information should not appear in the Material and Method section.

Reply: Thank you for the suggestion, this will be moved to the Discussion section in the revised draft

Discussion section is unnecessarily long and need thorough revision. The title of “4.1 Controls on SOC stability: importance of carbon burial and terrace age” and “4.2 Main controls on temperature sensitivity” are basically ok, but in each part, the logical thread of the discussion part is not clear.

Reply: Thanks for the comments. We agree that the Discussion section could be improved with a clearer structure. In doing so we will rework the Discussion section with a focus on (1) reducing the redundant contents that are not closely related to the main results (e.g., Line 380-390); (2) improving the logic and connection of each part of Discussion, especially in 4.1 section, we do identify this kind of issue.