**hessd-8-C535-2011, Comments by Anonymous Referee #1**

**(**Received and published: 18 March 2011)

This paper presents the Tibetan Plateau soil moisture and temperature network. In the current context of development of soil moisture validation data bases, this paper is very relevant since it presents a new data set. This data set is of high interest for satellite and land surface models soil moisture validation activities. It provides valuable information on soil moisture and temperature in a region where very few data is available.

The introduction is very well written and it indicates adequate references. However the ITC model (and its use) is not well described and it would improve the paper to include a sub-section on this model and simulations, as indicated in the comments below. The presentation of the results need to be structure and clarified using Tables and defining properly the acronyms used in the legends. I recommend this paper to be published after the revisions indicated below are accounted for.

***General Response: We wish to thank the reviewer for the constructive and detailed comments. We agree with reviewer's general comment that in the submitted manuscript the description should be extended for clarity. Our primary objective is, however, to present the plateau scale soil moisture and soil temperature observatory, and its availability for quantifying uncertainties in coarse resolution satellite products. We have, therefore, chosen to omit the part related to the ITC model in the revised manuscript. We also add an evaluation of all available reprocessed SMOS data for the Maqu site and have included tables with statistics. As for the other comments a point by point response is provided below.***

General Comments

The introduction is very well written and it describes very clearly the importance of soil moisture validation activities, in particular for the current and future soil moisture satellite missions. The objective of the paper is then clearly defined in the introduction: to present the Tibetan soil moisture and temperature observatory.

However the abstract and the text are not consistent with the introduction. The abstract contains many acronyms and it focuses on the comparison between satellite products, ITC model and ground data. The ITC model is not mentioned in the introduction and it is not described in the text. It is only mentioned twice in parenthesis at the end of section 3. Then in the results section the ITC model is again an important component.

***Response: As indicated in the General Response, we have removed the part related to the ITC model for consistency with the evaluation of satellite products. We have improved the abstract as suggested by the reviewer. As a consequence, the title is changed to "The Tibetan Plateau observatory of plateau scale soil moisture and soil temperature (Tibet-Obs) for quantifying uncertainties in coarse resolution satellite and model products"***

The reader does no what is the ITC model and therefore the results discussion is difficult to follow. Page 257 line 9 the authors say that "The ITC-model retrievals are derived with : : :. the assumption that for coarse footprint satellite scatterometer data, the backscattering coefficient of the land surface is…". The reader understands that the ITC model is an active microwave inversion model. But the rest of the page 257 is very confusing. For example line 20 the authors mention that "the SMOS vegetation parameterisation (SMOS, 2007) was adopted". This is confusing because active and passive microwave inversion algorithms are generally very different. After reading this page it is not clear whether the ITC model is a radiative transfer model or not. If so, the reader does not know how the inversion is done (seems to be a forward model). It is not clear either if it is for active or passive microwaves (both SMOS and ASCAT and backsattering coefficients are mentioned).

***Response: We have removed the ITC model part and added evaluation of some available SMOS data, in order to demonstrate the value and uniqueness of the plateau scale soil moisture and soil temperature observatory.***

Lack of indication of the ITC model in the introduction and not having a clear description of the ITC model makes the results section very unclear. The purpose of showing the ITC model results should be explained in the introduction. And it would greatly improve the overall clarity of the paper to

***Response: We realized the confusion generated in this aspect and have modified the text as described previously.***

Specific comments:

Some of the acronyms are not defined when they are used for the first time in the paper: AMSR-E, ASCAT, ITC in the abstract, and then in the paper ASCAT, METOP, ITC. ERS and WACMOS are not defined at all.

***Response: These have been improved in the revision.***

Units need to be added in the figure 2 axis. Figure 2 is not clear. Both the text and the caption indicate the the figure shows soil moisture and temperature measurements. However the legend indicate acronyms containing ITC (ITC-TE2, ITC-TE4, ITC-TSM1). It is important to clarify the legend of the figure and lines because as it is now it is very difficult to understand what represents the figure.

***Response: The figures, tables and texts are made consistent with the same naming and legends.***

Figure 2 shows a soil moisture increase in April 2008. Soil moisture increase from 0.1m3/m3 to_0.25m3/m3 and then back to 0.1m3/m3. The temporal scale is difficult to see but the duration of the peak is very short (_1day at most). The text page 255 lines 17-18 explains that the peak is due to a brief soil temperature change, increasing from freezing to above 1 degree C. However this explanationi is not convincing since the temperature plot (Figure 2 top panel) shows that temperature is already above one degree before. Is this increase not due to a sensor or a data logger issue at this date?

***Response: This statement cannot be verified independently because we had only one sensor and one data logger at the location. To avoid being speculative, this specific statement is removed. The plots are remade with soil texture specific calibration.***

Page 255, line 11, it would be useful here to include some text to tell that Figure 2 includes wetland site (TE2, SM2) and grassland site (TSM1, TE4, SM4). Using more explicit acronyms and providing a table to summarize soil depth and site would help.

***Response: Table 1 has provided all relevant information. To help the reader understand Fig. 2 better, some explanatory texts are added in the figure caption.***

Page 256, when discussing the Figure 3 results, the authors should acknowledge that soil moisture measurements (from both in situ and microwave sensors) depend on the soil dielectric constant, which is related to the liquid soil moisture content. But then in Figure 6 it is surprising that in situ soil moisture is above 0.1m3/m3 while soil is freezing for several months with temperature is around -5 degrees C. The authors need to clarify this point.

***Response: It may seem indeed strange that in-situ measurements of soil moisture was around 0.1 $m^3/m^3$ while the soil was frozen with temperature below -5 $^oC$. However, from engineering investigations, it is known that confined liquid water within a porous material submitted to frost action does not simultaneously freeze at the same temperature which is commonly attributed to the interaction between water and pore surfaces, water impurity, or supercooling. As a consequence, an initially water-saturated porous material remains filled by both ice and liquid water down to at least -80 $^oC$ (Jehng et al., 1996 from Fabbri et al., 2006). So it should not be assumed that the soil is completely frozen when the soil temperature is below zero $^oC$. We have added one sentence to clarify this point.***

***Ref. A. Fabbri, T. Fen-Chong, and O. Coussy, 2006, Dielectric capacity, liquid water content, and pore structure of thawing–freezing materials, Cold Regions Science and Technology, 44, 52– 66.***

For all figures 2 to 6 the x-axis is difficult to read. It would be clearer to use a letters for the Months. Years do not need to be written with all the dates.

***Response: These have been improved.***

Technical corrections

Page 254 line 19: replace “Rosany” by “Rosnay”
***Response: changed.***

Page 248, remove line 6 (“Section 2.1.1..”) since it is the only subsection of section 2.1
***Response: removed.***

Page 250, same comment for subsection 2.2.1
***Response: removed.***

Page 252, same for subsection 2.3.1
***Response: removed.***

Page 253: SMAP launch is expected to be in 2014
***Response: changed ‘2012’ to ‘2014’***

Page 253 line 17: replace “enable” by “enables”
***Response: changed.***

Page 266, the reference SMOS should indicate the latest version of the SMOS ATBD.
***Response: changed to “SMOS, 2010: SMOS level 2 Processor for Soil Moisture Algorithm Theoretical Basis Document (ATBD), SO-TN-ESL-SM-GS-0001, Issue 3.e, Date 24/01/2010.”***

***We wish to thank the reviewer for the very constructive comments that help to improve the quality of the manuscript.***