Earth Syst. Dynam. Discuss., 5, C587–C590, 2014
www.earth-syst-dynam-discuss.net/5/C587/2014/

Earth System Dynamics Discussions Open Access

Interactive comment on "Exploring objective climate classification for the Himalayan arc and adjacent regions using gridded data sources" *by* N. Forsythe et al.

J. Böhner (Referee)

juergen.boehner@uni-hamburg.de

Received and published: 5 December 2014

General comments: The manuscript analyses and assesses climate classifications for the Himalayas and adjacent regions, based on selected surface climate variables (long term means of the time period 1980-2009) from four reanalysis products (JRA-55, ERA-Interim, NASA-MERRA, NCEP-CFSR). Although, in my opinion, the authors overemphasised the relevance of the climate classification scheme for the spatially explicit assessment of climatic influences on water resources and crop growth – this justification is stressed throughout the entire manuscript and the basis for the selection of variables, but not really underpinned by novel scientific insights – the methodically

solid analysis provides an interesting input into the discussion of the suitability, precision and applicability of (competing) reanalysis products. The presented work is technically sound, well written, and well organized. The abstract provides a good summary of the paper and the Figures and Tables are suitable supplements to the text. The methodical setup is well founded and related scientific contributions in this area of research are adequately referenced. Summarizing, the presented material and analysis results are worth to be published in ESD, hence, I judge the paper to be acceptable for publication with minor revisions.

Specific comments: 1. Page 1107, lines 1-3: "To establish a common framework, the "native" resolution data from each reanalysis was regridded (sub-divided) to a common 0.25$\times$0.25 decimal degree spatial resolution." What I miss is the method, used for regridding, and, in particular, a justification for the drastic refinement (in case of JRA-55 the 25-fold data density). Although a spatial standardization of the different reanalysis products leads to a better comparability of the data sets, however, a major alternative would have been to stay closer to the original horizontal discretization (e.g 0.5 x 0.5 Degree Lat./Long.). A more sophisticated altitude-adjustment is likewise an increasingly established method, which prevents from misinterpretations of differences between the reanalyses, solely or at least mainly driven by differences in the resolution. This is particularly valid for steeper areas (e.g. the Gorges region) with rather complex difference pattern (e.g. the pixilated pattern of JRA-55 precipitation minus ensemble mean versus the rather rhythmic differences of NCEP-CFSR, Figure 2). Although the Authors addressed these effects on page 1110 (lines 9-11), an additional figure, which, by analogy with Figures 2 and 3, presents an ensemble altitude and individual elevation differences, or a simple figure with "native" orographies would likely ease the understanding and assessment of resolution effects and, indeed, illustrates the advantages of a higher resolution (of NCEP-CFSR) in mountainous environments.

2. Page 1104, Lines 24-26 and Page 1105, Lines 1-7: In this section, the authors define the calculation of means and diurnal ranges and moreover stress the need, "to

make the extracted climatic values as comparable as possible." Although the comparability was assessed to be crucial for the analyses, the diurnal temperature ranges (DTR) had been computed from 6h (JRA-55, ERA-Interim) and 1h temporal resolution (NASA-MERRA) or taken as specifically reported TDR values (NCEP-CFSR). For the comparability between the different reanalysis products, it would have been more appropriate to use consistently 6h values, available for all reanalyses, and to depict the advantages of a higher temporal resolution in one sentence. However, the authors may give a short justification for the use of different data bases for DTR.

3. Page 1121, Lines 4-25: In order to illustrate the "supplementary dimension" of the presented methods for the evaluation of climate model control period outputs, results of the climate classification scheme, applied to a dynamically downscaled model-ensemble control simulation are presented and compared with the reanalysis based classification. Apart from the fact, that such a comparison, in my opinion, offers little more than a visualisation of differences between model simulations and reanalyses, and remains by far beyond the comprehensive metrics, required for a systematic evaluation of model skills and biases, the entire model excursus looks poorly integrated. A comparison of classification results for different time-slices would be more appropriate to illustrate its added values but is still in progress. Hence, I suggest to shorten and move this aspect into the conclusion section as outlook.

4. Page 1137, Figure 4 and Page 1130, Table 3: I'm a bit surprised that PC2 was dominated by precipitation inputs (Table 3) whilst in Figure 4 the shape of the Tibetan Plateau is quiet clearly represented in all four reanalyses (at least under consideration of the different spatial resolutions). I would assume that this is rather a signal of the MAM and JJA mean temperatures than due to precipitation. May be I'm wrong, however, please check.

Technical Corrections: 1. Page 1104, Line 26 – Page 1105, Line 1: "In all cases daily means were calculated as the mean of the available sub-daily time-steps." Page 1106, line 6-7: "Hence, Tavg (mean temperature) and DTR – both calculated from

tmax (maximum temperature) and Tmin (minimum temperature) [....]." The averaging methods are contradicting, please check.

2. Page 1137, Figure 4: Please add an information about the units in the legend.

Interactive comment on Earth Syst. Dynam. Discuss., 5, 1101, 2014.