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Climate of the Past Discussions

Interactive comment on "Multiscale regression model to infer historical temperatures in a central Mediterranean sub-regional area" *by* N. Diodato et al.

N. Diodato et al.

giannibellocchi@yahoo.com

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To the Editor of Climate of the Past

Subject: reply to Reviewer #2, manuscript cp-2010-91

Dear Editor,

An improved version of the manuscript, already supplied 14 February 2011, contains evidence of progress in the text and accounts for the issues raised by Reviewer #2.

Sincerely, The authors

Anonymous Referee #2 Received and published: 02 March 2011

Reviewer. After a long a complex reading of the paper my conclusion is to reject the paper in the present form, however to be honest the paper is so confused that for me it was very hard to evaluate it in more accurate and precise manner and therefore is up to the Editor the final decision

Authors. Evidence of improvements in the text is documented in the revised manuscript, already supplied online on 14 February 2011.

R. In my opinion the first reason of that confusion, came from what the authors intend for "modeling", in particular "regional model" and so on , in the climate community this word is related to "numerical/analytical model" and not in some thing that seem much more a statistical algorithm, which physical meaning is very mysterious.

A. The new text specifies (in the Introduction, lines 95-100, and elsewhere) that "statistical modelling" is the object of this study.

" In this study, we have considered an alternative approach to address the statistical modelling of temperature variability, based on documentary records and previous large-scale reconstructions. In particular, a documentary-based technique was developed based on multiscale temperature regression (MTR)–model at sub-regional level. An area covering Southern and Central Italy and named in this paper Mediterranean Sub-regional Area (MSA) is the focus of the investigation. "

R. The second general comments is related to the data, i.e. 68 data set, that are also very sparse in time and the number that, if I understood well, are real 68 data and not 68 records (?),moreover looking at Tab.1a seem to me that the category of the anomalies is quite arbitrary and definitively the number is real insufficient for any statistical analysis and therefore put at risk all the results of the paper.

A. The term "records" is now replaced by "years" (line 146).

" Two distinct climate periods (1867-1903 and 1972-2002) were included in the calibra-

tion dataset (68 years in total) for two main reasons. "

R. The look-up table of categories has a geometric interpretation, represented by an additional figure (Fig. 2). The variability around the average temperature of the MSA is shown, which explains the codes used to represent temperature anomalies. The text now comments on this, also based on geographical, climate factors (lines 184-208).

" Fig. 2. Geometric interpretation of monthly values of the Temperature Anomalies Scale Index (TASI) for winter and summer (see Table 1a for details). Black line: mean seasonal temperatures; red lines: reference values for positive temperature anomalies; blue lines: references values for negative temperature anomalies. "

" The geometric interpretation of the classification process is shown in Fig. 2. The asymmetric profile for winter and summer seasons is a bi-dimensional simplification based on observations and documentary-proxy data. For the study-area, positive (red line) and negative (blue line) temperature anomalies result asymmetrically arranged around the mean seasonal values (black line). The latter are long-term average temperatures calculated, for the study-area, from the European database of Luterbacher et al. (2004). In the case of negative anomalies, the baseline is the freezing point of water (0 °C). A baseline for all seasons was not set to reproduce positive anomalies. In this case, in fact, temperature extremes are dictated by the Mediterranean latitudes. Although this region presents a twofold climate regime, where both tropical and mid-latitude aspects play a role, the latitudinal radiative flux stands out as the main factor determining the temperature. Advective transport off northern Africa can also occasionally affect the Mediterranean, but the seasonal variations are well marked (e.g. Schiano et al., 2000; Lionello et al., 2006) and, notably, temperatures in winter are never as high as summer values. Negative anomalies were assigned to cover the gap between the mean value and the freezing point, which is only sporadically (or never) approached in summertime (N/A). In winter (December, January, and February), values of -1 (cold) / +1 (warm) and -2 (very cold) / +2 (very warm) are consistent with temperature values deviating up to three and four times the standard deviation, re-

spectively. Abrupt jumps from “very cold” (-2) to “freezing” (-4) in winter are due to the lack of appreciative intermediate states during the calibration period. In the case of positive anomalies, a similar scheme is reproduced for summer season (June, July and August). Negative anomalies are instead doubled (July-August) or tripled (June) compared to winter, because most evidence of “cold” and “very cold” conditions in the historical sources only refers to cooling to temperatures well below the seasonal mean. "

R. I suggest to the authors to be more clear on the origin and on the physical meaning of the equations 1 to 4 and mainly on the quantitative relevance of the data set and in general to rewrite all paper in significant way.

A. As many mathematical details (meant to describe the background used to develop our statistical model) are not essential in the context of this paper, this part is now simplified (lines 233-248). Interested readers may refer to the seminal literature.

" A statistical model of sub-regional temperature estimation was created with aims of prediction and explanation. For prediction, the model structure was generated based on Box and Draper (1972). In particular, a determinant parameter-estimation criterion for multiresponse data was derived upon the primary assumption that the disturbance terms of different cases are uncorrelated. A corollary assumption was that, in a single case, the disturbance terms have a fixed, unknown variance-covariance matrix for different responses. A model was written along this path, assuming multiple responses and dependence on a set of parameters, as referred to by Bates and Watts (2007): the temperature random variable is a function depending on some predictors by a set of parameters, and assuming the sum of the errors equal to zero. To contribute to the aim of explanation, influential predictors were identified and insight gained into the relationship between the predictors and the outcome based on climate history and modelling background. In this path, the temperature random variable comprises predicting variables at regional, (.)R, and sub-regional, (.)SR, scales (Fig. 3). Once regional and sub-regional components are identified, one can estimate the relationship

between expected temperature and predictors. "

Please also note the supplement to this comment:
http://www.clim-past-discuss.net/6/C1530/2011/cpd-6-C1530-2011-supplement.pdf

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Interactive comment on Clim. Past Discuss., 6, 2625, 2010.