**Climate
of the Past
Discussions**

Interactive comment on "Tree-ring proxy based temperature reconstructions and climate model simulations: cross-comparison at the Pyrenees" by I. Dorado Liñán et al.

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This manuscript uses tree-ring proxy data to reconstruct changes in warm-season temperature for the Pyrenees region over the last millennium. The uncertainty arising from the techniques used to standardise the tree-ring series is investigated, and the reconstructions are compared against both global and regional climate model simulations.

By investigating the uncertainty in tree-ring-based temperature reconstructions, the manuscript tackles an important issue. The investigation of these uncertainties is comprehensive, and the authors are to be commended for this. However, the manuscript as a whole has a number of flaws: it is too long; the aims are not clearly expressed;

and the role of the data-model comparison is unclear.

Nonetheless, the manuscript is novel and makes a valuable and important contribution. I therefore recommend that it be accepted for publication in Climate of the Past, subject to the following comments being addressed.

General comments

1. Generally, the manuscript is too long. In particular, the Discussion section, at nearly seven pages, is much too long. The text would benefit from being edited for length, which would also assist with clarity.

2. The abstract should be revised to better reflect the contents of the manuscript. In particular, it does not make any statements regarding the results of the uncertainty analysis, which are the most significant outcome of the study.

3. The aims of the study are not clearly expressed. Is it to analyse the uncertainties in the reconstructions, to perform a data-model comparison, or both? This is not clearly indicated by either the title, abstract or introduction.

4. The manuscript is not clear as to why the model simulations are included, and they add little to the manuscript in the current form. Is the aim to evaluate the models themselves, to evaluate the specific simulations, to evaluate the reconstructions, or to investigate the driving mechanisms of past temperature changes? The aims of the data-model comparison should be stated much more clearly, particularly in the Introduction, and the modelling aspects of the paper should be strengthened if they are to be retained.

5. Some of the abbreviations and symbols used are confusing. "PCA", which is the commonly-used abbreviation for Principal Component Analysis itself, is used to refer to each of the individual PCA runs (PCA1 ... PCA25). It would be better to use different labels (e.g. Run1 ... Run25). Also, "T 05-09" is a confusing symbol for May-September temperature; a symbol such as T_{MJJAS} would be clearer.

Specific comments

1. p3922, lines 6-7: Proxies do not directly record temperature or precipitation. I suggest replacing "mostly for" with "which can be used to reconstruct climate parameters such as".

2. p3923, lines 14-15: Only some boundary conditions are derived from proxy data; orbital parameters, for example, are not.

3. p3923, line 24: The improvement in the characterisation of land use categories is a consequence of the higher resolution, so this statement is unnecessary.

4. p3923, line 26 onwards: There have been many studies which have sought to evaluate climate models at both global and regional scales, including many generated by projects such as PMIP. So the statement that this is "not common" is incorrect. This paragraph could be revised to discuss the potential motivations for data-model comparison.

5. p3926, line 27: It would be helpful to provide a reference such as Cook and Kairiukstis (1990) for the bi-weight robust mean.

6. p3927, line 1: Why truncate at 5 samples? Esper at el (2003) could be cited here to justify this.

7. p3927, lines 12-13: This sentence could state "By applying a combination of four different procedures for standardization and three different procedures for aggregation, this gave a total of 12 regional chronologies for the Pyrenees region." Otherwise, it was not clear to me at first why there are 12 different regional chronologies.

8. p3927, lines 16-17: The phrase "to obtain the corresponding scores of the principal components (PCs) in to the time segments" is not clear.

9. p3928, lines 6-7: Büntgen et al (2008) show that MXD in the Pyrenees is more strongly correlated with maximum temperature than with mean temperature. Can the

authors please explain and justify why they calibrate against mean temperature in this study.

10. p3929, line 5-19: The authors should summarise the actual boundary conditions applied in each simulation, as well as the differences between Erik1 and Erik2 (how do the initial conditions differ; what effects has this been shown to have elsewhere?). Although the authors do provide references, a brief summary should be provided here.

11. p3932, lines 16-25: I would like to see more discussion of the differences between the long-term trends, given that the differences are very large and the significance of this for reconstructing past temperature changes. Also, I doubt if it is meaningful to refer to some of the chronologies as having a "below-average" temperature. Is there anything significant about the average?

12. p3932, lines 25-27: One or more references should be provided for the MCA and LIA.

13. p3932, lines 27-29: More data should be provided here. In order to conclude that the interdecadal variations "clearly" coincide with solar changes, a reconstruction of past solar activity should be shown in Figure 6. Also, it is more accurate to say "solar grand minima" and the authors should provide one or more references.

14. p3933-3935, Section 3.3: This section is too long and consists of a fairly repetitive discussion of the amplitudes of temperature variations. Why is this important? In its current form, this section adds very little. The authors need to decide exactly why the model simulations are included in the manuscript and revise this section accordingly. Also, the authors should explain why they show the Z-score in Figure 7 rather than temperature.

15. p3934, line 24 to p3935, line 8: This paragraph discusses the reconstructions by themselves and would appear to belong in Section 3.2 instead.

16. p3939, line 13 to p3942, p7: The overall focus of this discussion, which considers

forced versus unforced variability and the drivers of forced changes, is correct, and demonstrates how the model simulations can add value to the manuscript. However, it needs to be abbreviated for clarity. I suggest a brief discussion of the periods where the simulations and reconstructions agree (which suggests forced changes), followed by a brief discussion of the periods where they differ (which suggests internal variability, missing forcings, or errors in the models or reconstructions).

17. p3942-3943, Conclusions: Some discussion of the large differences in long-term trends between the reconstructions should be included.

18. p3943, lines 1-4: I agree, but this sentence is the first mention of volcanic activity. Volcanic forcing needs to be explicitly included in the analysis if this conclusion is to be stated here.

Technical corrections

1. p3922, line 4: "mechanisms" not "mechanism".

2. p3923, line 14: "characteristics" not "characteristic".

3. p3923, line 21: "model" not "models".

4. p3924, line 29: "tree-rings" not "tree-ring".

5. p3925, line 7: "evidence" not "evidences".

6. p3925, line 12: "in" the Pyrenees, not "at".

7. p3926, lines 3-4: "in the radial direction", not "in radial direction".

8. p3927, line 14: "time-spans", not "time-span".

9. p3927, line 18: "EOFs" not "EOF's".

10. p3927, line 19: "differences between" not "differences of".

11. p3927, line 20: "EOF"not "EOF's".

12. p3927, line 23: "regions such as" not "regions as".

13. p3927, line 27: "high-elevation sites in the Pyrenees", not "the Pyrenees high elevation sites".

14. p3928, line 11: "using" would be better than "by means of".

15. p3928, line 16: "calibrated against" not "calibrated on".

16. p3928, line 17: "validated against" not "validated on".

17. p3928, line 20: "derived using" not "derived from".

18. p3929, line 6: "the" not "the the".

19. p3929, line 18: "external forcings applied" not "used external forcings".

20. p3929, lines 21-22: Check hyphenation and capitalisation.

21. p3930, lines 5-6: This sentence could be clarified by removing "to be used ... on nested PCs".

22. p3930, line 8: "variance explained", not "explained variance".

23. p3930, line 10: "PCA21 to PCA25", not "PCA20 to PCA24"?

24. p3930, line 20: "the sign", not "sign".

25. p3931, line 2: "do not have" not "have not".

26. p3931, line 3: "and" not "with".

27. p3931, line 16: "to" not "as".

28. p3931, line 26: "the correlations are slightly lower" is clearer than "slightly lower".

29. p3931, line 27: "to" not "as".

30. p3932, line 15: "zero" not "0"; "reconstruction" not "reconstructing".

31. p3933, line 8: "discrepancies" not "the discrepancies".

32. p3933, line 10: "1970s and 1980s", not "70s and 80s".

33. p3933, line 22: "the middle" not "middle".

34. p3934, line 2: "seem to simulate the negative anomalies better".

35. p3934, line 4: "The global" not "Global".

36. p3934, line 9: "reconstructions" not "reconstruction".

37. p3934, line 13: "with respect" not "respect".

38. p3934, line 16: "larger" not "the larger".

39. p3934, line 17: "during" not "along".

40. p3934, line 18; "the largest" not "larger".

41. p3934, line 24: "the 24" not "24", "mPYR" not "the mPYR"; "vary" not "varies".

42. p3934, line 26: "small" not "tiny".

43. p3934, line 28: "using" not "with".

44. p3934, line 29: "amplitudes" not "amplitude".

45. p3935, line 1: "and those" not "or".

46. p3935, line 5: "smallest" not "tiniest".

47. p3935, line 6: "in" not "on".

48. p3935, line 10: "20th century" not "20th".

49. p3936, line 7: "has" not "have".

50. p3936, line 10 and p3937, line 13: "dataset" rather than "file"?

51. p3936, line 12: "techniques" not "technique".

52. p3937, line 3: "well-preserved" rather than "preserved".

53. p3937, line 26: "based on" not "based in".

54. p3939, line 4: add "the" before "divergence problem".

55. p3940, lines 8-9: "effects" not "effect".

56. p3940, line 11: "by" not "of".

57. p3940, line 12: "to" not "by"; "by" not "of".

58. p3940, line 14: "these" not "this".

59. p3941, line 1: "a negative" not "and negative"; "during the period" not "along".

60. p3941, line 2 and line 3: "the model" not "model".

61. p3941, line 7: "gas" not "gases".

62. p3941, line 8: "succession" not "successions".

63. p3941, line 12: "closed" not "close".

64. p3942, line 4: "demonstrating" not "performing".

65. p3942, line 6: "also display" not "are also displaying".

66. p3942, line 13: Suggest a word such as "unreliable" rather than "odd".

67. p3952, figure caption: ">5" or ">=5"?

68. p3953, figure caption: "Variance explained by" not "Explained variance of the"; "spans" not "span".

69. p3954, figure caption: Is the left column PC1 and the right column PC2?

70. p3957, figure caption: Panel a is not accurately described (there are two sub-panels, one of which appears to show annual values and the other the 20-year mean);

the instrumental record appears to be shown with a red line, not black.

Interactive comment on Clim. Past Discuss., 7, 3919, 2011.

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