Interactive comment **- Anonymous Referee #1 -** Received and published: 21 March 2017

our responses in BLUE

Climate signals in a multi species tree-ring network...

This is an interesting and thoughtful, well written paper that I recommend should be accepted and published in Climate of the Past with minor revision. It describes the generation and analysis of a multi species tree-ring network from central and southern Italy, and a reconstruction of late summer temperatures since the early 1700s based on this network.

Using RW and MXD from 27 sites in Italy (both conifers and some hardwoods), temperature and precipitation signatures were identified, and eventually a late summer temperature reconstruction based on MXD was generated. There is apparent divergence between observed and reconstructed temperature of about 1 degree C, possibly due to the impact of drought stress.

Para beginning on line 8 of intro: good to reference some of recent modeling studies of subtropical drying due to climatic change in western North America, Mediterranean..(e,g. Seager et al. papers) This paper has a good general overview/intro re the climate response in Mediterranean trees, which can be quite complex due to multiple influences on growth.

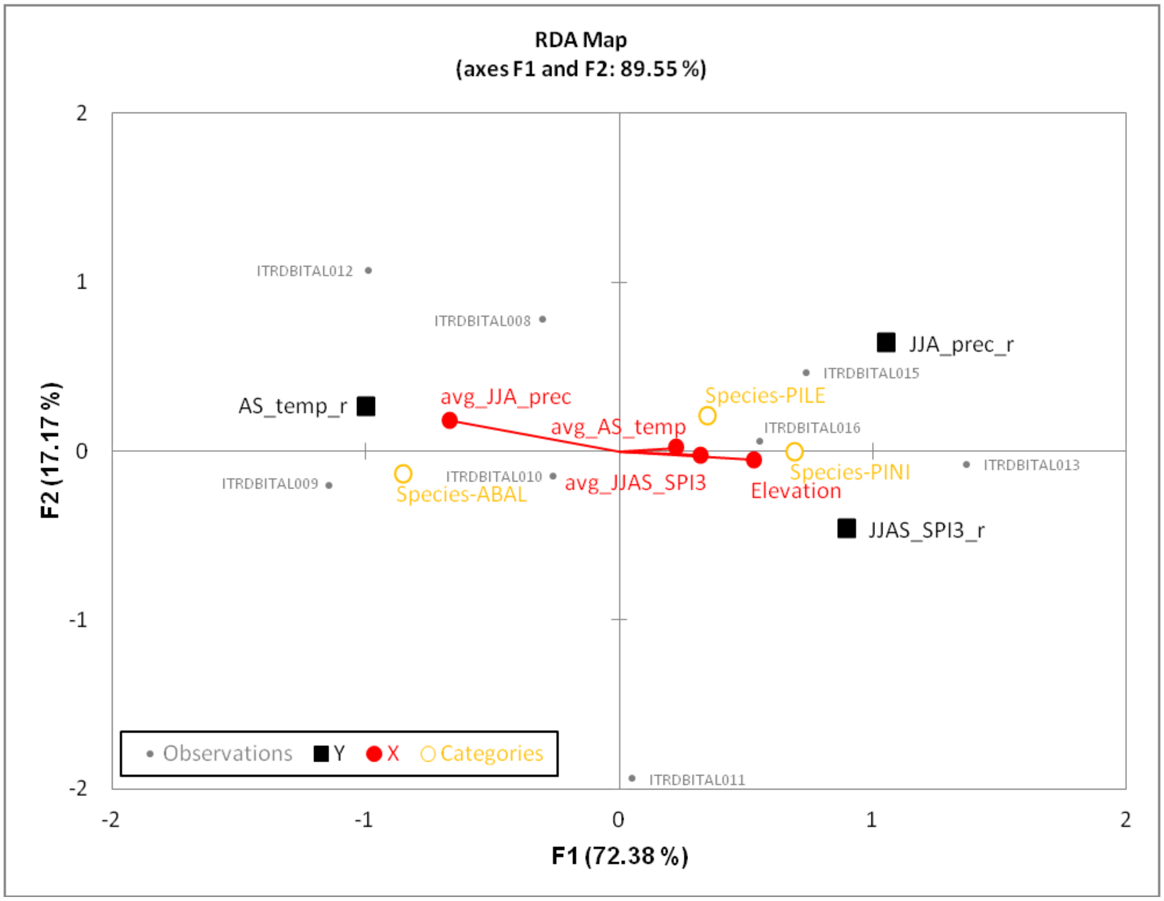
Thank you for suggesting to expand the introduction including also the changes involving subtropical environments in general. In the reviewed version of the ms. we will add some reference to other researches dealing with this topic.

as found elsewhere, rather well behaved MXD temp signal, here linked to drought at high temperatures. would like to see more about the gradient of response to climate in these trees across space and elevation..

We agree with the Referee that a deeper analysis of climate/growth response across space and elevation would add some interesting information. Considering the strength of the signals recorded and the number of chronologies available, we focused our attention on the MXD chronologies, and performed a redundancy analysis (RDA) selecting as response variables the bootstrapped correlation coefficients of climate-growth relationships (Fig. 3) and as explanatory variables the environmental variables (geographical characteristics and climatic averages over the period 1880-1980). In order to attenuate co-variation within the environmental variables, a PCA was run before the RDA and the following variable were chosen:

- Elevation (co-varying with Longitude: our sites are placed at higher elevation at increasing longitude);
- avg_AS temperature;
- avg_JJA precipitation (co-varying with Latitude: higher latitude means higher precipitation amounts)
- avg_JJAS SPI3

From the analysis we obtained the following figure:



Caption: Ordination biplot *(RDA analysis) of climate-growth relationships (response variables, Y) and environmental variables (explanatory variables X: elevation and climatic averages over the period 1880-1980).* ABAL =*Abies alba*; PILE = *Pinus lucodermis*; PINI = *Pinus nigra.*

The strength of the AS temperature signal recorded in the MXD chronologies depends also on summer precipitation amounts (co-varying with Latitude, in our dataset of MXD) and Elevation (co-varying with Longitude, in our dataset of MXD): positive and negative correlation, respectively.

Summer precipitation amounts and elevation correlate negatively in our dataset of MXD, underlining the prevalence of the latitudinal gradient of higher precipitation at north over the expected altitudinal gradient of higher precipitation at higher altitudes: sites at north, even if at lower altitudes, receive more summer precipitation than sites at south, at higher altitude. The RDA analysis shows that summer precipitation amounts and elevation are the most influencing the AS temperature signal: the F1 axis alone explains up to 72% of the variance in response variables, and especially in AS temperature and JJAS SPI3.

Of the considered explanatory variables, it is especially the latitudinal regime of summer precipitation amounts that modulates the sensitivity to AS temperature and to summer drought: sites at north (more mesic and at lower elevation) show stronger climate signals than sites at south (more xeric and at higher elevation). Even if southern sites are at higher elevation (and this is usually supposed to give trees a higher sensitivity to temperature) they are less sensitive to the selected climate variables.

Considering the responses related to the type of species, it is evident that in our dataset the influence of AS temperature on MXD, in *Abies alba* is more affected by summer precipitation amounts than in *Pinus lucodermis* and *P. nigra*. On the other hand, the influence of summer drought on MXD, in pines is more affected by elevation.

We will put this analysis in the online materials as the objective of explaining climate-growth responses with respect to elevation or latitude is not a major objective of the paper. We will add some considerations on climate/growth response across space and elevation in the Discussion chapter.

Would be good to discuss impact of climatic forcings on the region - e.g. the NAO (warm and cold season).. Also volcanic events - The year 1699 also seen as a cold year/interval elsewhere in Europe, North America following volcanism..

In the reviewed version of the ms. we will add some considerations about the NAO and the volcanic events in the Discussion chapter.

We thank the Referee for his help in critically reading the ms.

The Authors, March 29th, 2017