



## **Variability in trends of monthly mean temperature amongst sites in the Tuscan Apennine Alps**

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We have investigated historical variability in seasonal and monthly mean temperature in the Tuscan Apennine Alps. Climate analysis focused on four montane sites that show almost uninterrupted time series of temperature data that go back until the end of the 1800s in two cases (Vallombrosa and Camaldoli, Tuscany, Italy). Results show that trends in monthly mean temperature may vary amongst sites even at short distance and similar elevation. The construction of master series of seasonal and monthly mean temperature may underestimate important differences in trends and variability at the local level to an extent that potential effects on forest growth and, perhaps, forest health risk may not be detected. For example,

- a very warm, decadal period occurring only at one montane site at higher elevation (Abetone, m 1340 asl);
- a change of winter mean temperature from a regime below 0°C to progressively above 0°C in the early 50s observed in another site only (Camaldoli, m 1111 asl);
- the presence of months with monthly mean temperatures that decrease over years within a general context of increasing mean temperature; and,
- levels of association of monthly mean temperature amongst sites that vary greatly over years even at short distance.

Such differences in monthly mean temperature trend and historical variability amongst sites would suggest that modeling of climate alterations at the regional or landscape level and/or using master series of climate variables may hide or even mislead understanding of potential effects on forest tree growth and health. This raises the need for investigating the alterations in temperature trends and relative historical variability at the local level to better understand effects on forest growth and health.