Piloting novel multi-centennial palaeoclimate records from mainland southeast Australia

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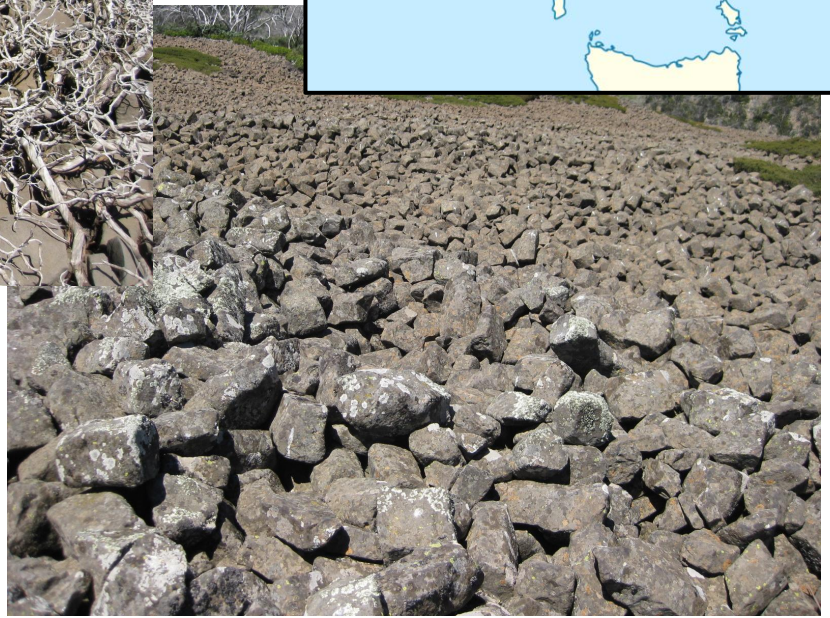
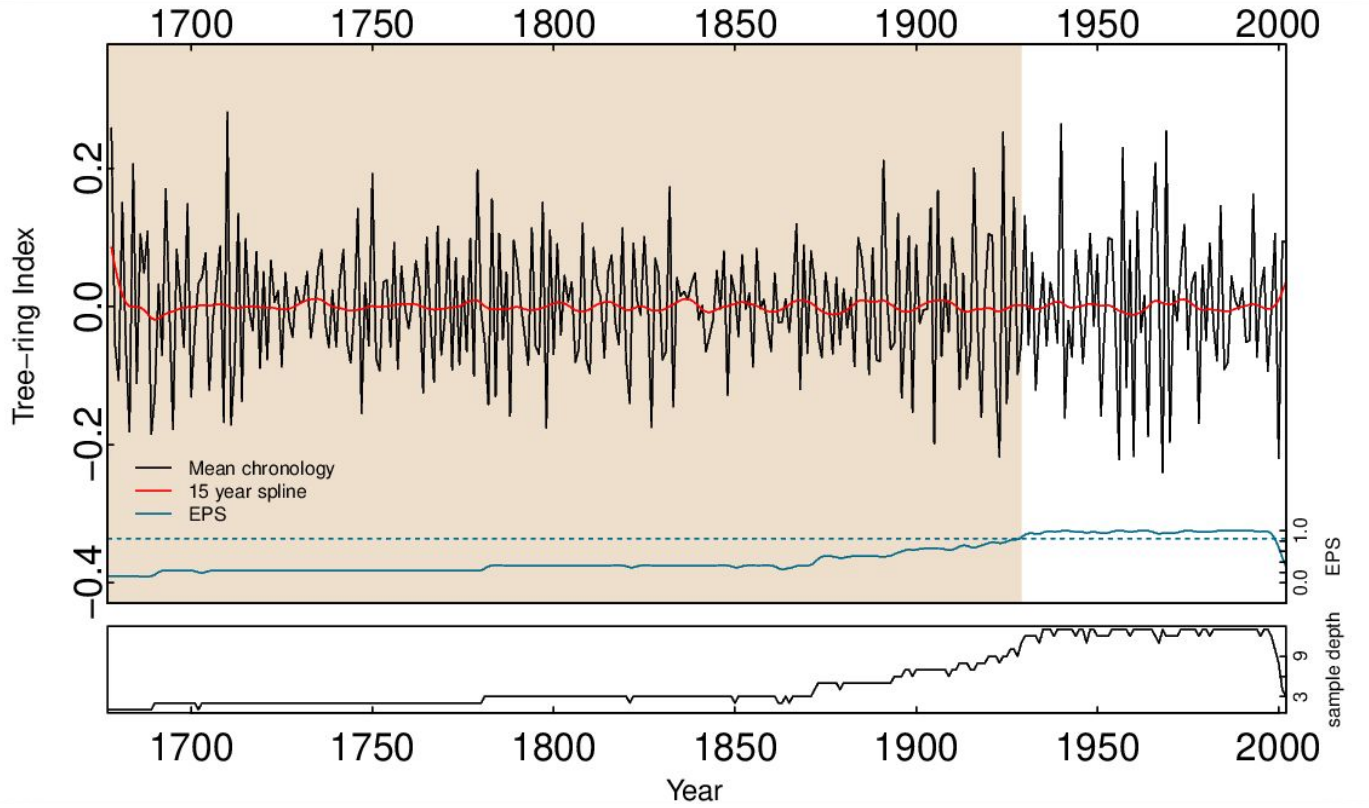


Podocarpus lawrencei.
Common name:
Mountain Plum-pine.


2 cm
1935 - 2002



Full detrended ring width chronology (1676 - 2002) based on 13 Mt. Loch *P. lawrencei* series from 9 samples (top panel) and concurrent sample resolution (bottom panel). Expressed population signal (EPS) denoted by blue line, with 0.85 threshold (dashed blue horizontal line).

Climate analysis

Observation station data

Air Temperature:

- **Omeo observation station (Bureau of Meteorology)**

Precipitation:

- **Harrietville observation station (Bureau of Meteorology)**

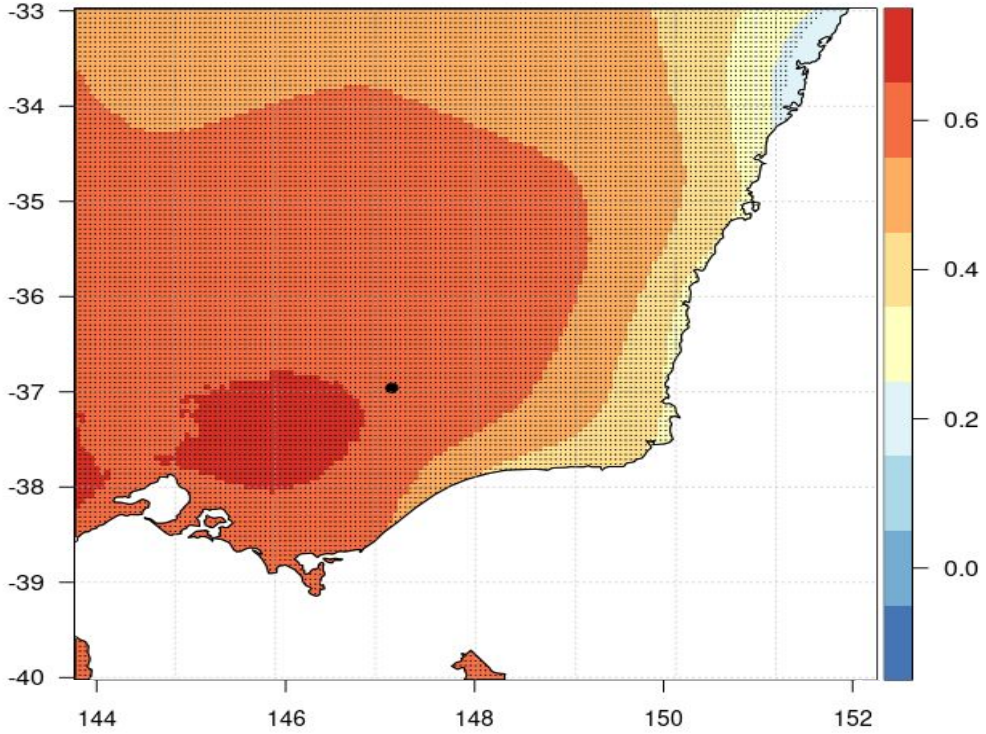
Snow Depth

- **Spencer Creek, NSW (Snowy Hydro)**

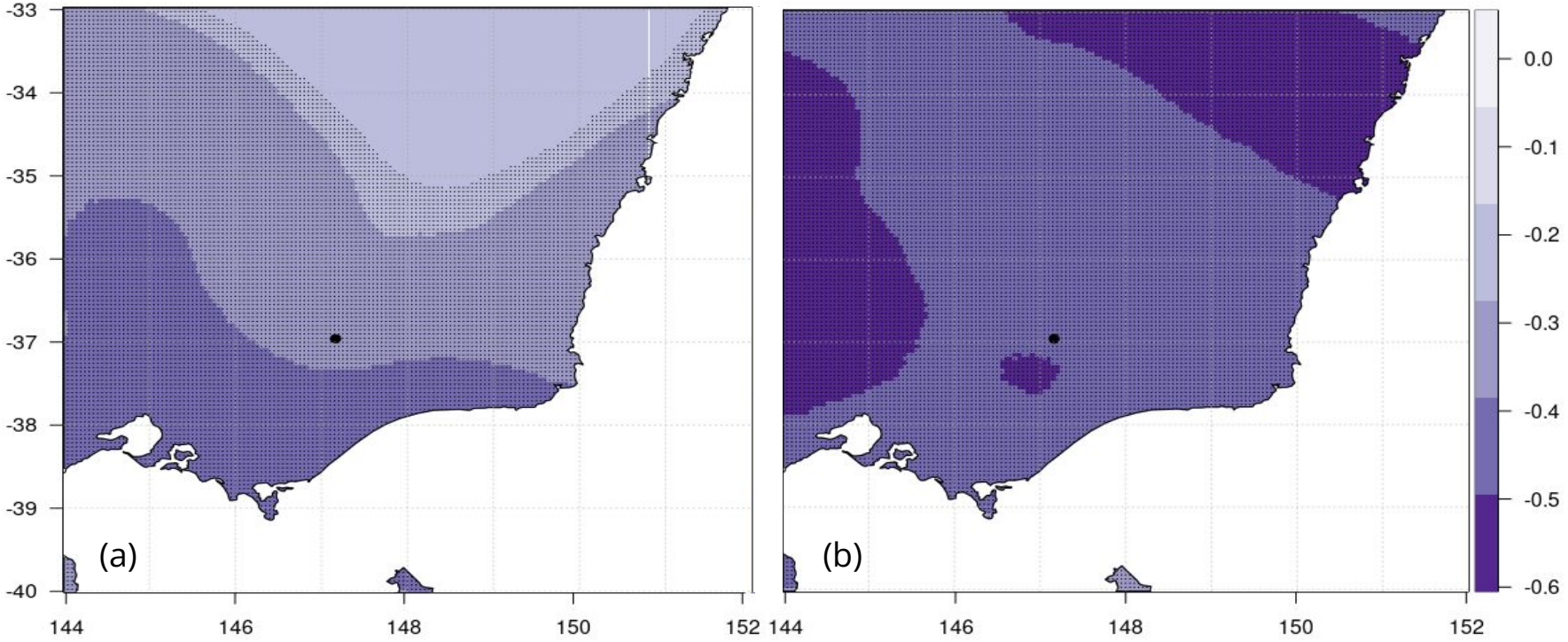
Australian Gridded Climate Data (AGCD)

Air Temperature

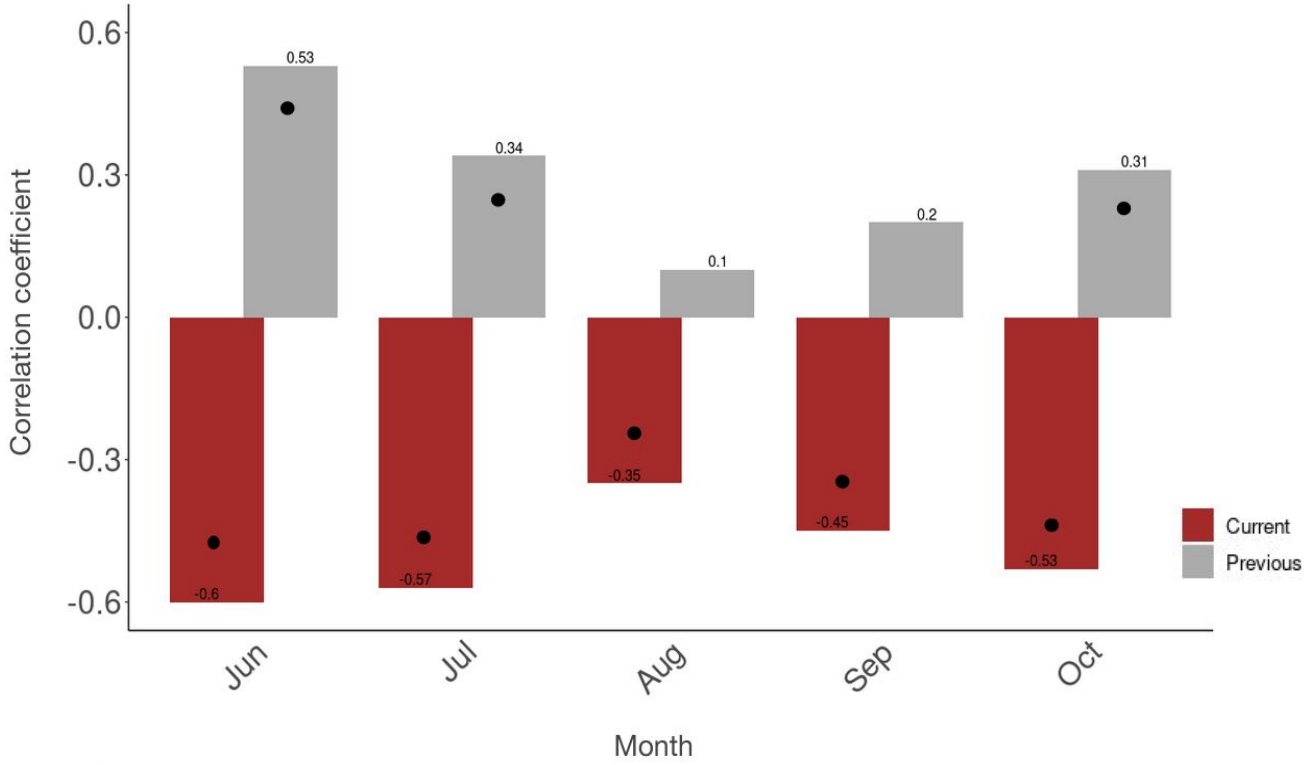
Precipitation



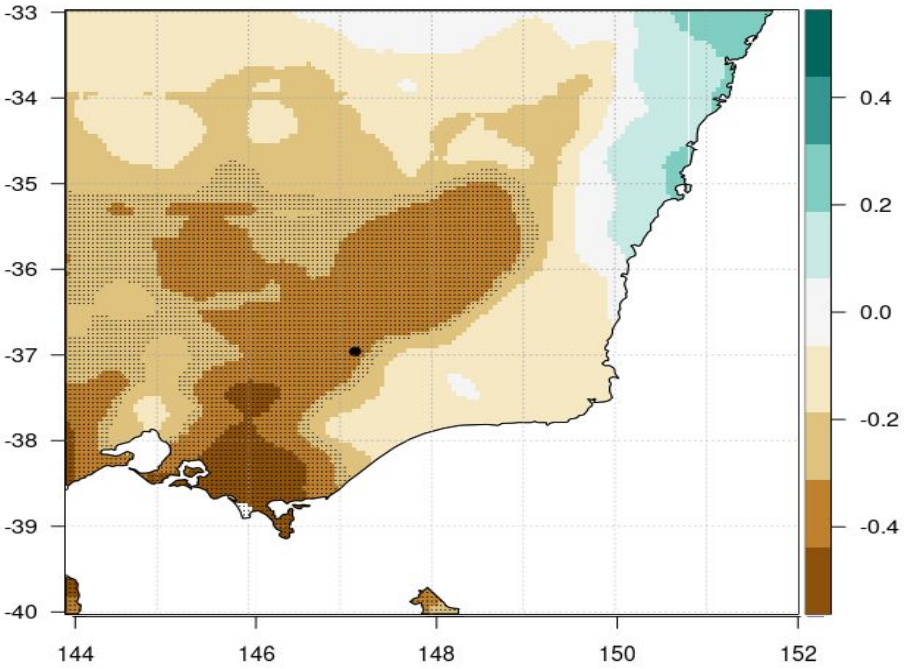
Correlations between *P. lawrencei* **RW** chronology and AGCD mean monthly **June, July and August** maximum temperatures for 1929 - 1998 period.



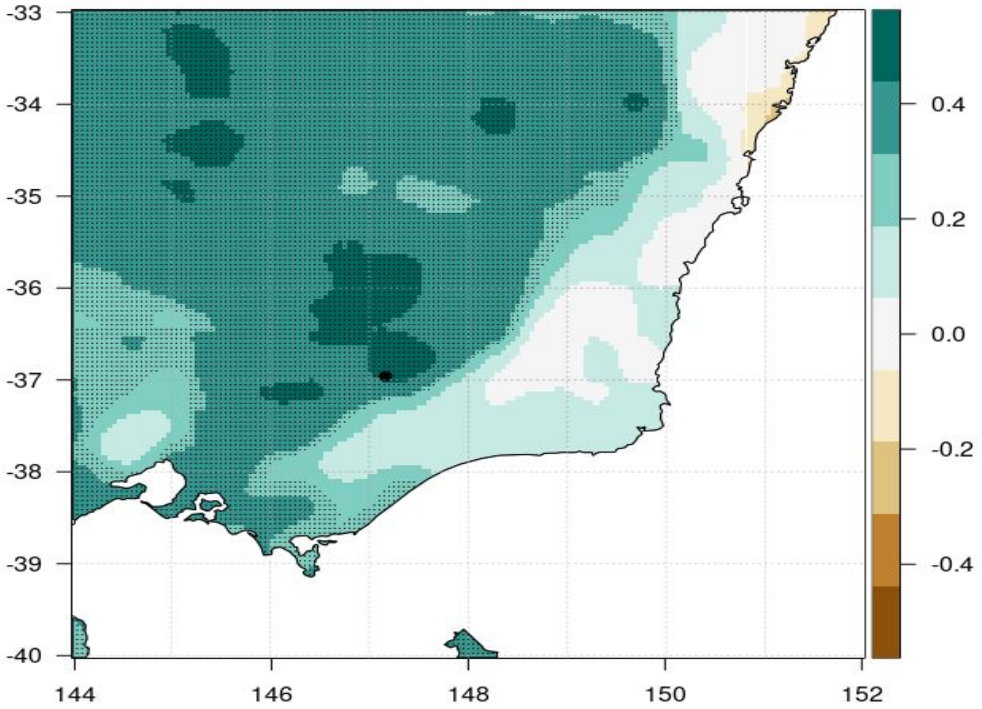
Correlations between *P. lawrencei* **ΔBI** chronology and AGCD mean monthly **October, November and December** maximum (a) and minimum (b) temperatures for 1929 - 1998 period.



Correlations between **RW** chronology and mean monthly **snow depth** at **Spencer Creek (NSW)**, across the period **1954-1998**, for both the current and previous growth year. Black dots indicate statistical significance ($p < 0.05$).



Correlations between *P. lawrencei* **RW** chronology and AGCD mean **June, July** and **August** precipitation for 1929 - 1998 period.



Correlation between *P. lawrencei* **ΔBI** chronology and AGCD mean **July** precipitation for 1929 - 1998 period.

Conclusions

- Strong correlations with mean temperature maxima, precipitation and snow depth, and climate sensitivity between remotely located sites indicate an exciting opportunity to develop an extensive dendrochronological network throughout the Australian Alps.
- To further explore the opportunities for climatological reconstruction and improve the quality and reliability of existing chronologies, greater sample size and replication is necessary.

Sample preparation and crossdating

- Samples were each sanded from 180 - 1500 grit with an orbital sander, and then by hand up to 2500 grit.
- High resolution scans (4800 dpi) were taken on an Epson Perfection V850 Pro flatbed scanner, in conjunction with SilverFast Ai professional software. Scans were IT8 colour calibrated.
- Samples were soaked in acetone to remove resins and minimise discolouration biases in BI data.
- Ring width and BI measurements (13 series from 9 samples) were taken on the program CooRecorder, and visual crossdating was conducted on CDendro.

Strong correlation (r = 0.72) with Mount Buller RW chronology developed by Brookhouse and Graham (2016).

Chronology development

- A data adaptive approach was required to detrend the RW and BI data.
- Smoothing splines were applied to each series and RW and BI indices were calculated as residuals from the fitted curves. Autocorrelation was removed.
- The bi-weight mean was taken to produce the final chronologies.

Multiple paths of measurement required for *P. lawrencei* chronology development, taken in CooRecorder.