Spatiotemporal variability and periodicities in moisture-sensitive tree-ring chronologies in the western interior (47-66° N)

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Summer (JJA) PDSI < 0, Calgary, 1895-2002

n = 15
n = 2
n = 5
Summer (JJA) PDSI < 0, Calgary, 1341-2004

n = 372
JJA PDSI < 0, Calgary, 1895-2002

r = 0.628

TRI (-ve departures), WCH, 1895-2004
Spring 1796, Edmonton House

At Edmonton House, a large fire burned “all around us” on April 27th (1796) and burned on both sides of the river. On May 7th, light canoes arrived at from Buckingham House damaged from the shallow water.

Timber intended to be used at Edmonton House could not be sent to the post “for want of water” in the North Saskatchewan River. On May 2nd, William Tomison wrote to James Swain that furs could not be moved as, “there being no water in the river.” (Johnson 1967: 33-39, 57)
Spring 1796, Edmonton House

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Interdecadal variability in western hydroclimate

Gobena and Gan, 2006, *Int. Journal of Climatology*
Hydroclimatic forcing, northern Chile
<table>
<thead>
<tr>
<th>Climate index description</th>
<th>Period</th>
<th>Data source</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean monthly Atlantic SST anomalies north of the equator.</td>
<td></td>
<td></td>
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<tr>
<td>Leading Principal Component of monthly SST anomalies in the north Pacific Ocean, poleward of 20°N.</td>
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<tr>
<td>Mean monthly SST anomalies for the Niño 3.4 Region, east central Tropical Pacific (5N-5S, 170-120W).</td>
<td></td>
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</tr>
</tbody>
</table>
### Growth Response to Climate Forcing

Table 4. Influences of climate forcings based on the spatial correlation patterns between the tree-growth PCs and global SST and SLP (Figs. 17-22).

<table>
<thead>
<tr>
<th>Species</th>
<th>Region associated to each PC</th>
<th>Climate forcing</th>
<th>Season</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PC1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Picea glauca</em></td>
<td>North</td>
<td>AMO (−)</td>
<td>Spring-summer</td>
</tr>
<tr>
<td><em>Pinus banksiana</em></td>
<td>East</td>
<td>PDO (−)</td>
<td>Winter</td>
</tr>
<tr>
<td><em>Pseudotsuga menziesii</em></td>
<td>South</td>
<td>ENSO (+)#</td>
<td>Winter-spring</td>
</tr>
<tr>
<td><em>Pinus contorta</em></td>
<td>North</td>
<td>AMO (−)</td>
<td>Spring-summer</td>
</tr>
<tr>
<td><em>Picea mariana</em></td>
<td>North</td>
<td>ENSO (−)</td>
<td>Winter-spring</td>
</tr>
<tr>
<td><strong>PC2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Picea glauca</em></td>
<td>East</td>
<td>PDO (−)</td>
<td>Winter-spring</td>
</tr>
<tr>
<td><em>Pinus banksiana</em></td>
<td>South</td>
<td>AMO (+)#</td>
<td>Winter</td>
</tr>
<tr>
<td><em>Pseudotsuga menziesii</em></td>
<td>South</td>
<td>AMO (−)</td>
<td>Winter-spring</td>
</tr>
<tr>
<td><em>Pinus contorta</em></td>
<td>South</td>
<td>No clear pattern</td>
<td></td>
</tr>
<tr>
<td><em>Picea mariana</em></td>
<td>East</td>
<td>PDO (−) and AMO (−)</td>
<td>Winter-summer</td>
</tr>
<tr>
<td><em>Pinus flexilis</em></td>
<td>South</td>
<td>ENSO (+)</td>
<td>Winter-spring</td>
</tr>
</tbody>
</table>

#: not coherent with the correlation results between PCs and the forcing indices.
Figure 24. Temporal evolution of 5-month running mean of normalized anomalies of SST in the Niño 3.4 region as indicator of El Niño-La Niña and growth responses of the high correlated Pinus flexilis and Pseudotsuga menziesii growth. An El Niño or La Niña event occurs if the 5-month running mean of normalized SST anomalies (relative to the period 1871-2000) exceed 0.57 SD (+0.4°C) or -0.57 SD (-0.4°C), respectively (Trenberth, 1997). The dotted line represents the tree growth.
Wavelet power spectra

*Pseudotsuga menziesii*
Wavelet power spectrum

*Pinus flexilis*
Increasing Drought Frequency

Central North America

Return Period (years)

Length of Dry Spell (days)

Today

~2070

Kharin and Zwiers, 2000
Drought scenarios using dendroclimatic, historical and GCM based precipitation records
S. Lapp and D. Sauchyn

a. Calgary Annual PPT
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