Water isotope balance
- Mica Creek

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Isotope balance of a forested watershed

Combination of watershed hydrology and isotope methods for an isotope mass balance under consideration of forested treatments (CC, PC, CF)

Water isotope balance (Mica Creek):

\[ P \cdot C_P = (E \cdot C_E + T \cdot C_{SW}) + SF \cdot C_R + GWR \cdot C_{SW} \{+/- \Delta SW \cdot C_{SW}\} \]

C: isotope concentration
P: precipitation
E: evaporation
SF: stream flow
T: transpiration
GWR: groundwater recharge
SW: soil water
1. Isotopes in precipitation

- Reference station in Moscow (weekly and monthly)
- Monthly sampling (CC, PC, CF) at Mica Creek
- Snow sampling in winter 2006

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**2006 mean:** -15.2  
**Winter mean:** -16.3

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<table>
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<tr>
<th>Month</th>
<th>Precipitation [mm]</th>
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<td>Dec</td>
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<tr>
<td>Jan</td>
<td>170</td>
</tr>
</tbody>
</table>

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**δ¹⁸O (‰ SMOW):**

- **2006 mean:** -15.2
- **Winter mean:** -16.3

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**Graph:**

- ST Mica Creek (waterisotopes.org)
- ST Moscow (waterisotopes.org)
- Moscow weekly
- Moscow weekly-weighed
- Moscow monthly

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1. Isotopes in precipitation

- Reference station in Moscow (weekly and monthly)
- Monthly sampling (CC, PC, CF) at Mica Creek
- Snow sampling in winter 2006
Isotopes in snow

- No altitude effect in snow
- Spatial variability vs. LAI
Isotopes in snowmelt

- No altitude effect in snow
- Spatial variability vs. LAI
- Spring snowmelt concentrations differ

"Isotopic composition of snow and snowmelt varies in response to forest management in Northern Idaho" (paper 1)
2. Isotopes in stream flow

- two weirs (snow-melt),
- seven flume sites
- monthly sampling
  at six sites (CC, PC, CF - springs, stream),
2. Isotopes in stream flow
Isotopes in stream flow 2004 - 2006

base flow sampling campaign
15-18 Sept. 2006
Base flow sampling

At 30 sites at Mica Creek

1. Discharge (salt-dilution)

2. Conductivity, silica, water chemistry

3. $^{18}$O, $^2$H and $^3$H (evtl. $^{13}$C, $^{15}$N)
Base flow sampling in September 2006

Conductivity (µS/cm) Sept., 15-18, 2006

Discharge (l/s)
Base flow sampling in September 2006
(2) "Isotope hydrological and hydrochemical characterization of base flow at Mica Creek Experimental Watershed, Idaho - USA"
3. Soil water isotopes

- Soil profiles at CC, PC, CF monthly during growing season

-> should represent transpiration

-> need soil water data
3. Soil water isotopes

1 Nov. 2006

(3) "...soil water isotope seasonality and impacts of forest treatments ..."
4. Water isotope balance

- Precipitation
- Stream flow
- Soil water
  Monthly during growing season
  -> should represent transpiration

- Tree-core / Transpiration
  Xylem water from monthly sampling of nine tree cores

- Evaporation
  No water vapor collecting so far
4. Water isotope balance

(4) "Isotopic mass balance of a mesoscale forested watershed, Mica Creek - Idaho"
Conclusions

- Isotopes in precipitation: reference stations in Moscow -> regionalization / sampling ongoing

- Isotopes in snow: variations within treatments

- Isotopes in stream flow, soil water, xylem: sampling / analyzing is ongoing


- Water vapor, separation of evaporation / transpiration needs future work (e.g. cold air drainage,...)