Impact of Inflow on Mountain Lake Heat Fluxes

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Introduction

Due to mountain lake's small size, small catchment areas and steep surrounding slopes, mountain lakes respond rapidly to changes in their catchment and inflow. This suggests a greater impact on their heat flux due to advection than their low altitude counterparts. Thus, can traditional one-dimensional temperature models, based solely on meteorologic conditions, represent their temperature cycles?

Methods

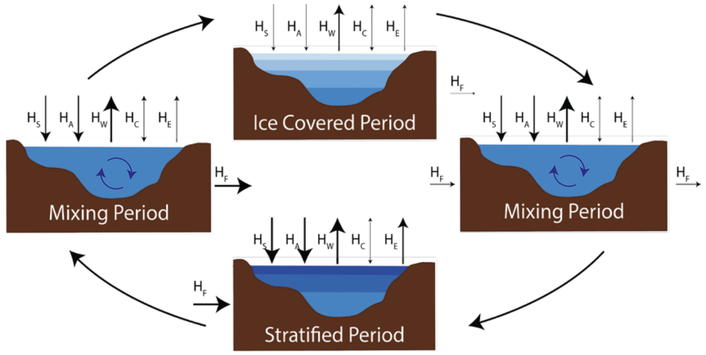
Scan for codes

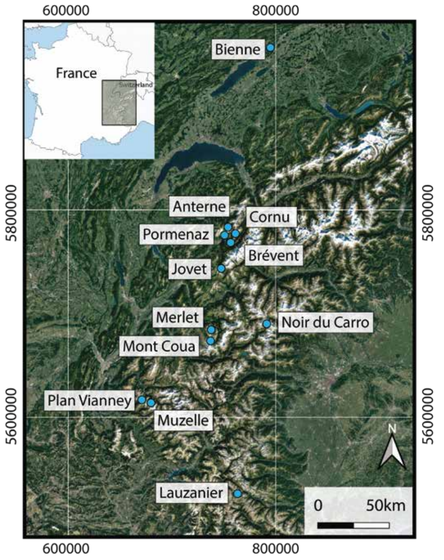
What about the lakes?

The lakes analyzed in this study are part of a network of mountain Lakes in the French Alps "Lacs Sentinelles". They are equipped with a mooring and temperature sensors at a resolution of 1 to 8 meters depending on their depth.

Additionally, the Bienne Lake, in Switzerland was analyzed to have a low altitude comparison.

Scan for more





What is ΔHC?

ΔHC is the daily difference in heat content of the lakes. These were calculated with approxamate volumes for layers of water and summed over the depth of the lake.

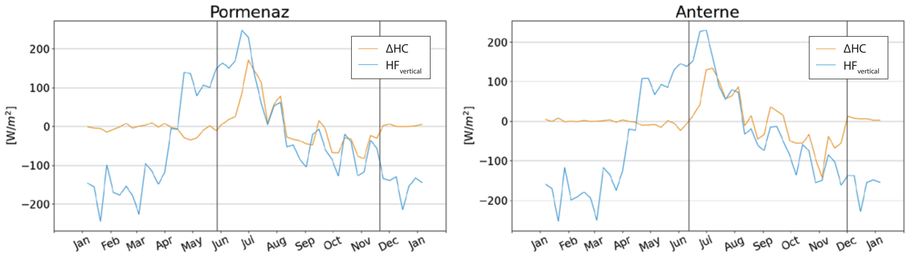
What is $HF_{vertical}$?

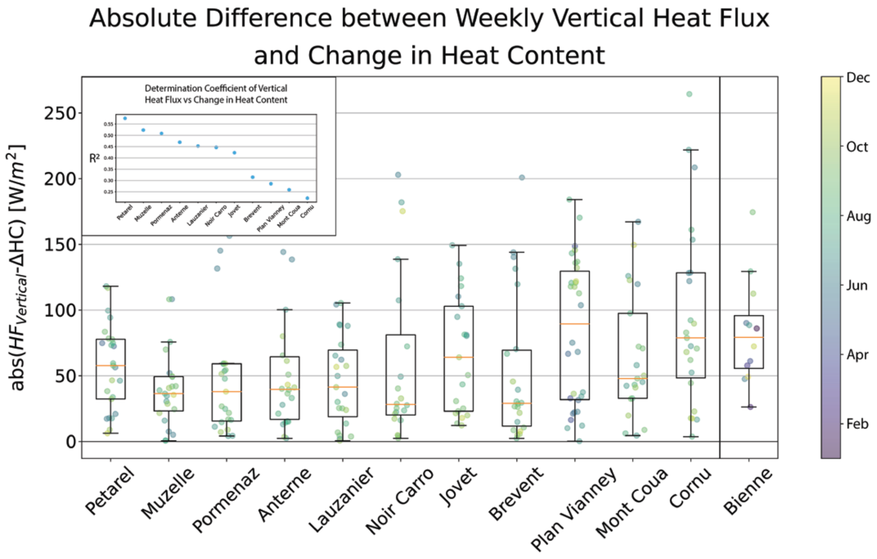
$HF_{vertical}$ is the sum of heat fluxes between lakes and the atmosphere listed below. These were calculated based on CROCUS meteo model data and equations described by Fink 2014.

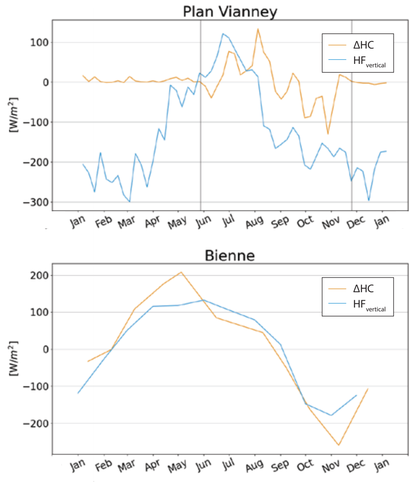
H_S : shortwave absorption
H_A : shortwave absorption
H_W : longwave absorption
H_E : evaporation or condensation
H_C : free and forced convection

What Is the Importance of Vertical Heat Fluxes in Mountain Lake Heat Fluxes ?

Results







Discussion

No Two Lakes Are Alike

- Lakes heat content change is not fully explained by vertical heat fluxes.
  - Advection and Latent ice heat flux
- These missing components add a lot of variability to lake's heat content
- However these are hard if not impossible to measure in the field.
- Thus it is important to further investigate the impact of horizontal heat fluxes in order to model mountain lakes

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