Use of wavelet analyses to study glacier hydrosystem in the tropical andes: 

building bridges between glaciology, hydrology and ecology

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BIO-ICE

Climate change, glacier retreat and the dynamics of biodiversity and ecosystem services

http://www.biothaw.ird.fr

Bolivia, Ecuador, Peru
In search of new glacial indices…
Meeting up with glaciologists and hydrologists
FIELD MEASUREMENTS

Water level time series
(time step: 30 min, year 2010)

Water level logger
Plastic tube
METHODS – Local Wavelet Spectrum

Detect flow variation at 24h-scale (= daily glacial flood)

Wavelet analyses on water level time series
METHODS – Local Wavelet Spectrum
METHODS – Scale average Wavelet Spectrum

Local wavelet power spectrum

Scale average wavelet power spectrum
Building glacier influence indices

Diurnal Variation Power

Scale average wavelet power spectrum

Diurnal Variation Temporal clustering

Diurnal Variation Frequency
RESULTS – Equatorial glacier-fed streams

Glacier-fed stream

Groundwater stream

Power (degC²)

Time (days)
RESULTS - Glacial meltwater resurgence

![Graph showing the relationship between diurnal variation power and glacier cover in the catchment. The equation is $r = 0.93$, $p < 0.001$, $F = 76.14$, $Y = 2.4x$.]

Local wavelet power spectrum

![Map showing the location of Antisana.]

Diurnal Variation Power

![Image of a stream near Antisana.]
Reinforcing the bridge

Stream-scale experiment over 4 years

Simulation of 30% discharge decrease

Use of drone and thermal camera to map the thermal heterogeneity of thermal streams
Technical Note: Using wavelet analyses on water depth time series to detect glacial influence in high-mountain hydrosystems

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Thank you for your attention

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http://dangles.naturexpose.com

http://es.ird.fr/la-mEDIATECA/videos-en-linea-canal-ird