Readme File

High temporal resolution hydrometeorological data collected in the tropical Cordillera Blanca, Peru (2004-2020)

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Documentation and metadata

This resource provides a comprehensive hydrometeorological dataset collected over the past two decades throughout the Cordillera Blanca, Peru. The data recording sites, located in the upper portion of the Rio Santa valley, also known as the Callejon de Huaylas, span an elevation range of 3738 - 4750 m a.s.l.

Weather Stations

The four automatic weather stations supply detailed meteorological observations, and are situated in a variety of mountain landscapes, with one on a high-mountain pass, another next to a glacial lake, and two in glacially carved valleys.

- The weather stations collect the following variables: precipitation, solar radiation, temperature, relative humidity, dew point, and wind direction, speed, and gusts.
- These variables are collected at either 30- or 60-minute intervals depending on the station, see Table 1 below. These are point measurements of the variables.
- Descriptions and accuracies of the sensors used to collect these variables are provided in Table 2 below. Uncertainty of weather station variables falls within the accuracies provided in Table 2.
- Cuchillacocha and Casa de Agua weather stations measured variables from 2013 to 2020
- Llanganuco weather station began recording observations in 2004, experienced an outage from 2010-2015, and recorded until 2020.
- Portachuelo weather station began recording in 2006, until it was stolen in 2014. This station did not record temperature and relative humidity after mid-2011.

Temperature and Relative Humidity Data Loggers

Four additional temperature and relative humidity loggers complement the weather stations within the Llanganuco valley by providing these data across an elevation gradient.

- These variables are collected at 60-minute intervals at each station, see Table 1 below. These are point measurements of temperature and relative humidity.
- Descriptions and accuracies of the Lascar sensor used in this network are provided in Table 2.

- Lascar sensor uncertainties are related to the influence of solar radiation and are accounted for during daylight hours following a year-long comparison between a protected temperature sensor and Lascar sensor.
- The Lascar stations are not missing data.

Streamflow Gauges

The six streamflow gauges are located in tributaries to the Rio Santa and collect high temporal resolution runoff data.

- All gauging stations measure raw data in the form of water pressure and barometric pressure along with water temperature. These pressure data are then applied to rating curves calculated for each location.
- These variables are collected at either 15- or 30-minute intervals, depending on the station, see Table 1 below. These are point measurements of pressure and temperature.
- Descriptions and accuracies of the sensors used to collect these variables are provided in Table 2 below.
- It is estimated that there is a ± 2 mm variation in water stage due to the turbulent nature of the streams in the region
- All discharge stations began recording in 2008. All stations experienced occasional outages. Pumapampa stopped recording in 2016. Data for all other stations is provided until 2019. Ongoing data observations are underway and will be appended to this repository when gathered.

The sites of all these sensors for hydrological and meteorological observations are labeled in the map in Figure 1 below. All sampling rates in the .csv files are the same as identified in Table 1.

Table 1

Stream Discharge Data			
Catchment Name	**Catchment Abbreviation**	**Catchment Filename**	**Sampling Rate**
Casa de Agua	cda	cda_lev-q-t.csv	15-min/30-min
Cuchillacocha	cuchilla	cuchilla_lev-q-t.csv	15-min/30-min
Llanganuco	llan	llan_lev-q-t.csv	15-min/30-min
Pachacoto	pacha	pacha_lev-q-t.csv	15-min
Pumapampa	puma	puma_lev-q-t.csv	15-min
Querococha	quero	quero_lev-q-t.csv	15-min
Variables in Strem Discharge Datasets			
Datetime			
Barometric Pressure (m)			
Total Pressure (m)			
Water Stage (cm)			
Adjusted Water Stage (cm)			
Discharge (cms)			
Temperature (°C)			
Weather Station Data			
Weather Station Name	**Weather Station Abbreviation**	**Weather Station Filename**	**Sampling Rate**
Cuchillacocha	CUCHWX	Cuchillacocha_CUCHWX_5Jul13_6Apr20.csv	30-min
Casa de Agua	CDAWX	CasaDeAgua_CDAWX_4July13_1July19.csv	30-min
Llanganuco	LLANWX	Llanganuco_LLANWX_12Jul04_10May19.csv	60-min
Portachuelo	PORTWX	Llanganuco_PORTWX_17Jul06_28Jun14.csv	60-min
Variables in Weather Station Datasets			
Datetime			
Precipitation (mm)			
Solar (Wm-2)			
Wind Direction (°)			
Wind Speed (m/s)			
Gust Speed (m/s)			
Temperature (°C)			
RH (%)			
Dew Point (°C)			
Lascar Station Data			
Lascar Station Name	**Lascar Station Abbreviation**	**Lascar Station Filename**	**Sampling Rate**
LlanUp-1 LAS	LlanUp-1 LAS	LlanUp-1_17Jul06_23Jul15_3955m.csv	60-min
LlanUp-1A LAS	LlanUp-1A LAS	LlanUp-1A_18Jul15_5Jul2019.csv	60-min
LlanUp-2 LAS	LlanUp-2 LAS	LlanUp-2_17Jul06_28Jun14_4122m.csv	60-min
LlanUp-2A LAS	LlanUp-2A LAS	LlanUp-2A_18Jul15_5Jul2019.csv	60-min
LlanUp-3 LAS	LlanUp-3 LAS	LLanUp-3_17Jul06_9Aug16_4355m.csv	60-min
LlanUp-3A LAS	LlanUp-3A LAS	LlanUp-3A_18Jul15_5Jul2019.csv	60-min
LlanUp-4 LAS	LlanUp-4 LAS	LlanUp-4_17Jul06_18Jul15_4561m.csv	60-min
LlanUp-4A LAS	LlanUp-4A LAS	LlanUp-4A_9Jul18_5Jul2019.csv	60-min
Variables in Lascar			
Datetime			
Temperature (°C)			
RH (%)			
Dew Point (°C)			

Figure 1
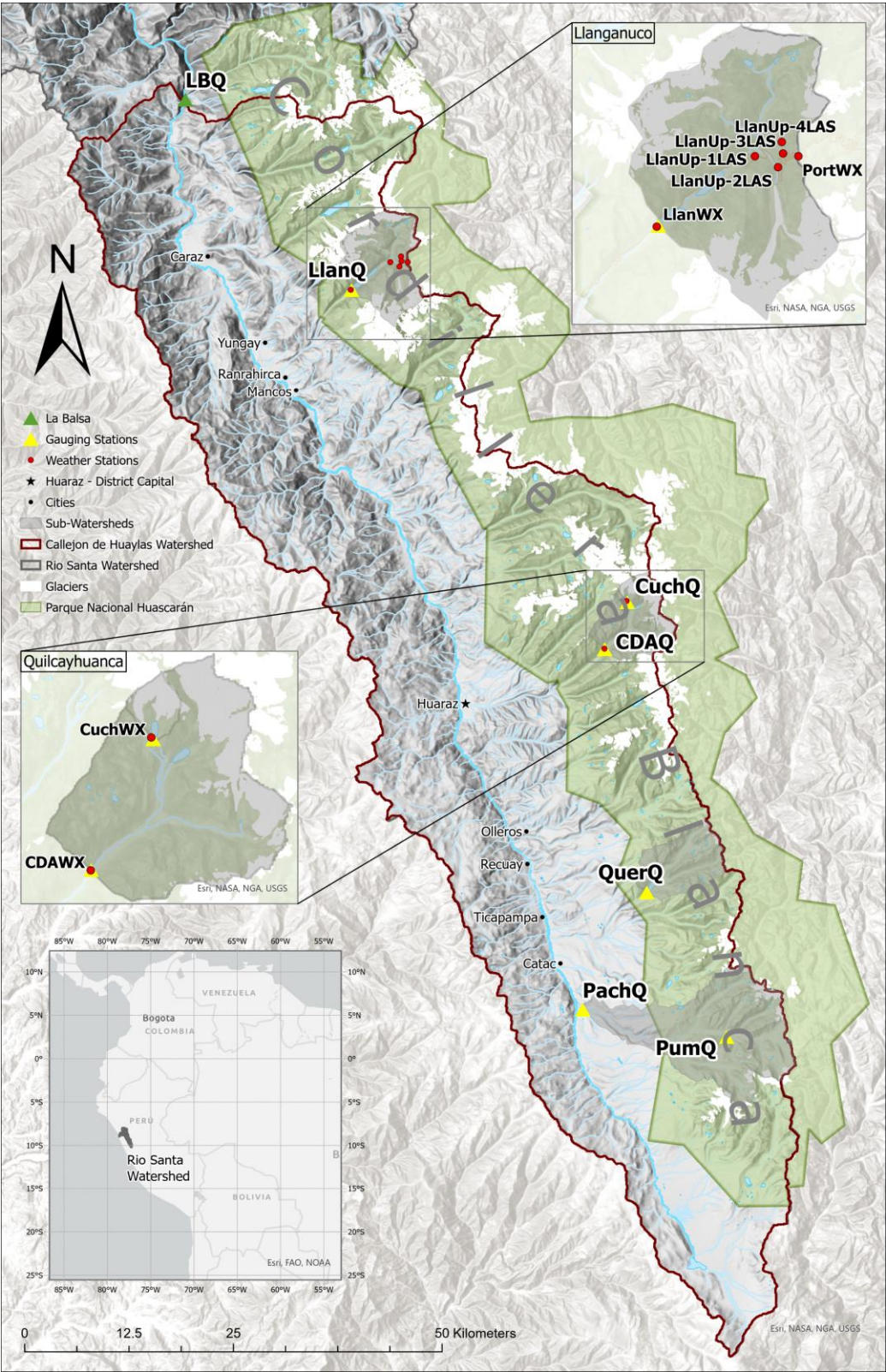
Access to each datafile is found by opening the "Stream Discharge Data" and "Weather Station Data" under the "Content" tab on Hydroshare. Lascar data is accessed through the "Weather Station Data" and then the "LASCAR Data" folder. All files are labeled as shown in Table 1 above, and are accessed through the visual assistance provided in Figure 2 below:

Figure 2
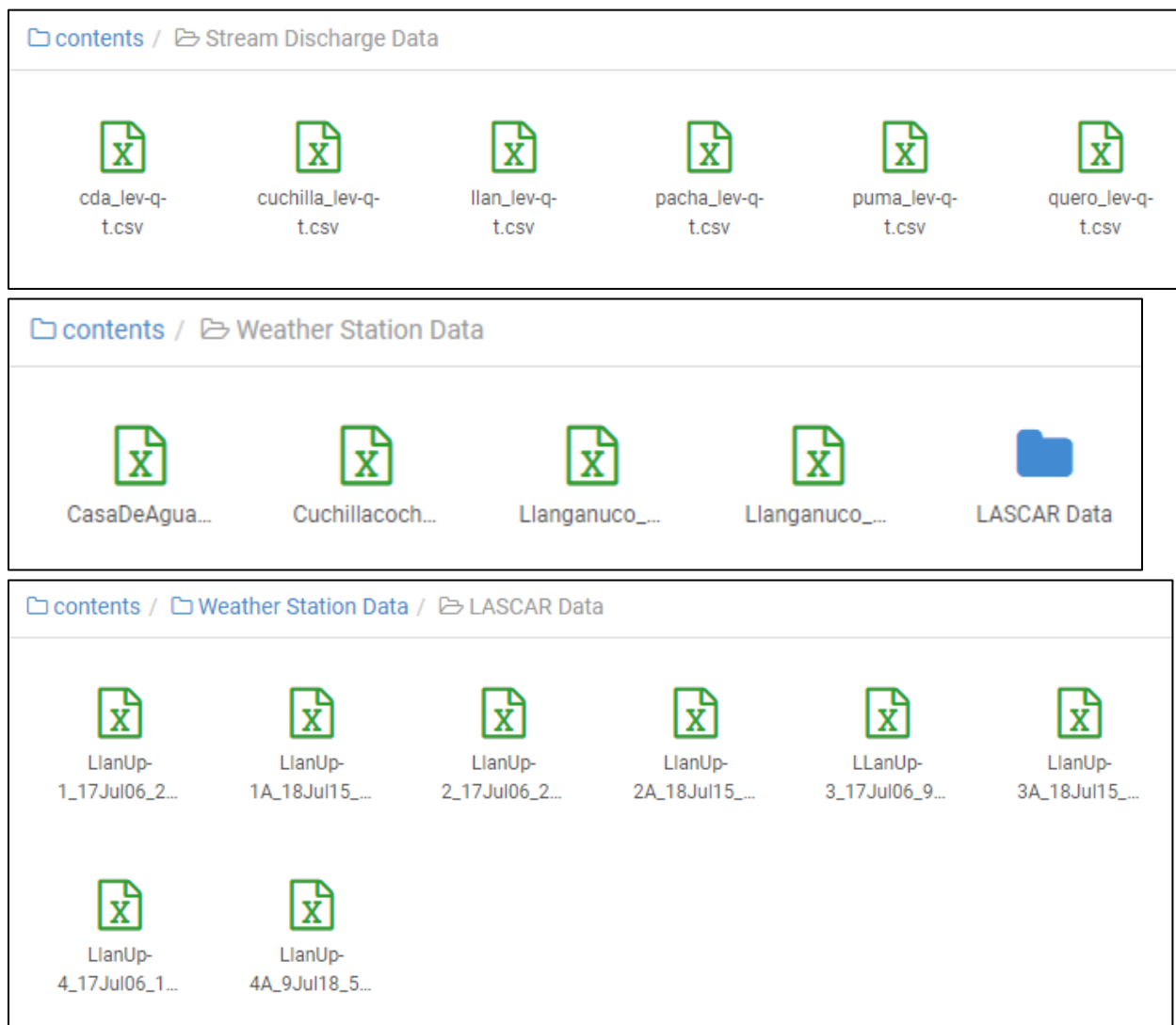
The data is separated into (i) meteorological data recorded by permanently installed automatic temperature and relative humidity loggers (Lascars), or automatic weather stations, and (ii) hydrological data consisting of stage and discharge data from multiple sub-catchments. The data collection consists of multiple time series of point observations from both meteorological and hydrological measurement sites. The sensors used in this dataset are included in the table below.

Table 2

Variable	Sensor	Accuracy	Unit
Discharge	Model 3001 Solinst levelogger Edge	± 0.05 kPa; ± 0.05 ºC	kPa; ºC
Air temperature	Onset HOBO S-THB-M002 Temperature RH Smart Sensor	± 0.2 °C	°C
Precipitation	Onset HOBO S-RGB-M002 0.2 mm Rainfall tipping bucket Smart Sensor	± 0.2 mm	mm
Relative humidity	Onset HOBO Temperature RH Smart Sensor: S-THB-M002	± 2.5 %	%
Wind speed	Onset HOBO S-WSB-M003 Wind Speed Smart Sensor	± 1.1 m/s	m/s
Wind direction	Onset HOBO S-WDA-M003 Wind Direction Smart Sensor	± 5 °	°
Incoming solar radiation	Onset HOBO S-LIN-M003 Solar Radiation Smart Sensor	± 10 W/m²	W/m²
Atmospheric pressure	Onset HOBO S-BPB-CM50 Smart Barometric Pressure Sensor	± 3.0 mb	mb
Lascar Air Temperature and Relative Humidity	Lascar EasyLog EL-USB-2	± 0.3 °C; ± 2.25 %	°C; %