Desarrollo de tecnologías para la telemetría nival

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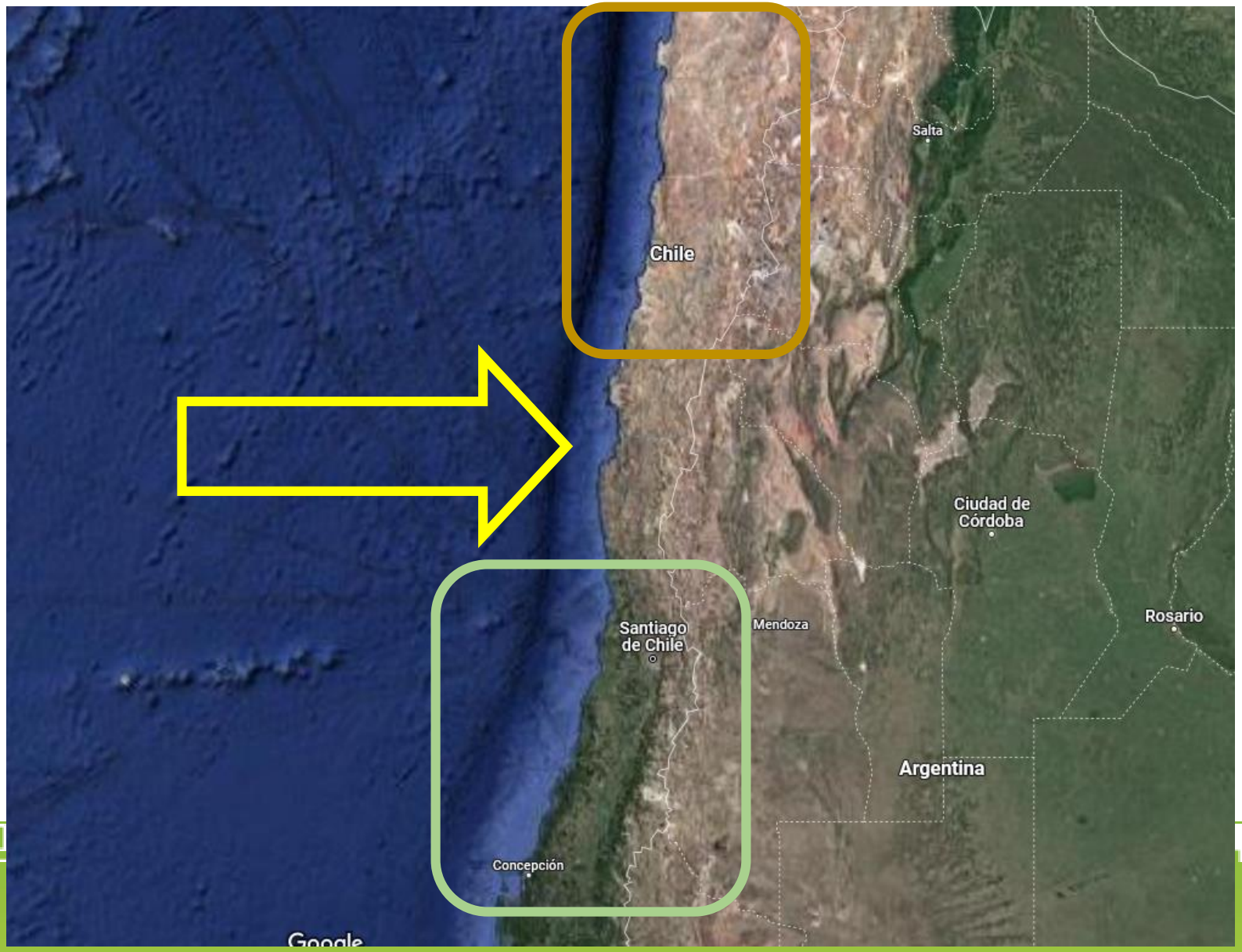
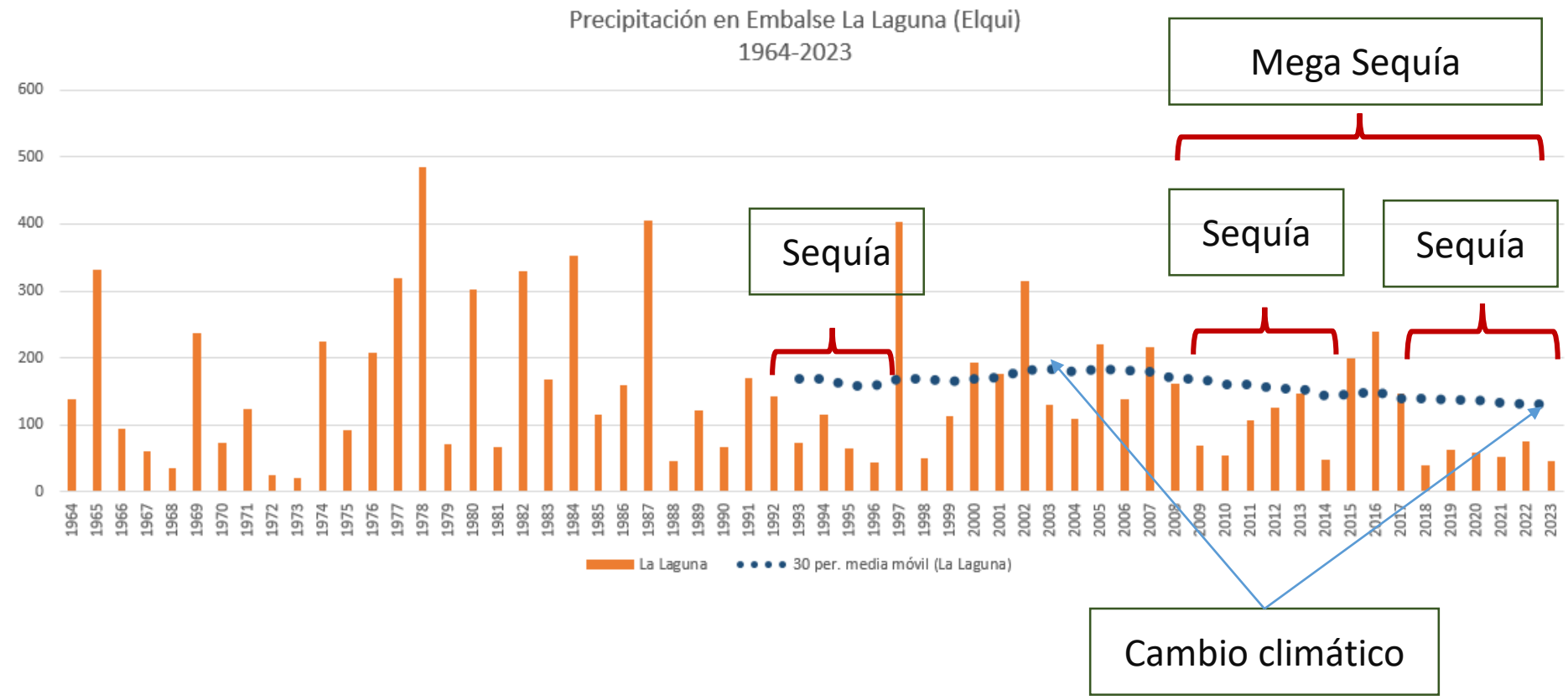
Ing. Computación
Coordinador grupo CEAZAmet

Noviembre 2023

Contexto: Zona de transición



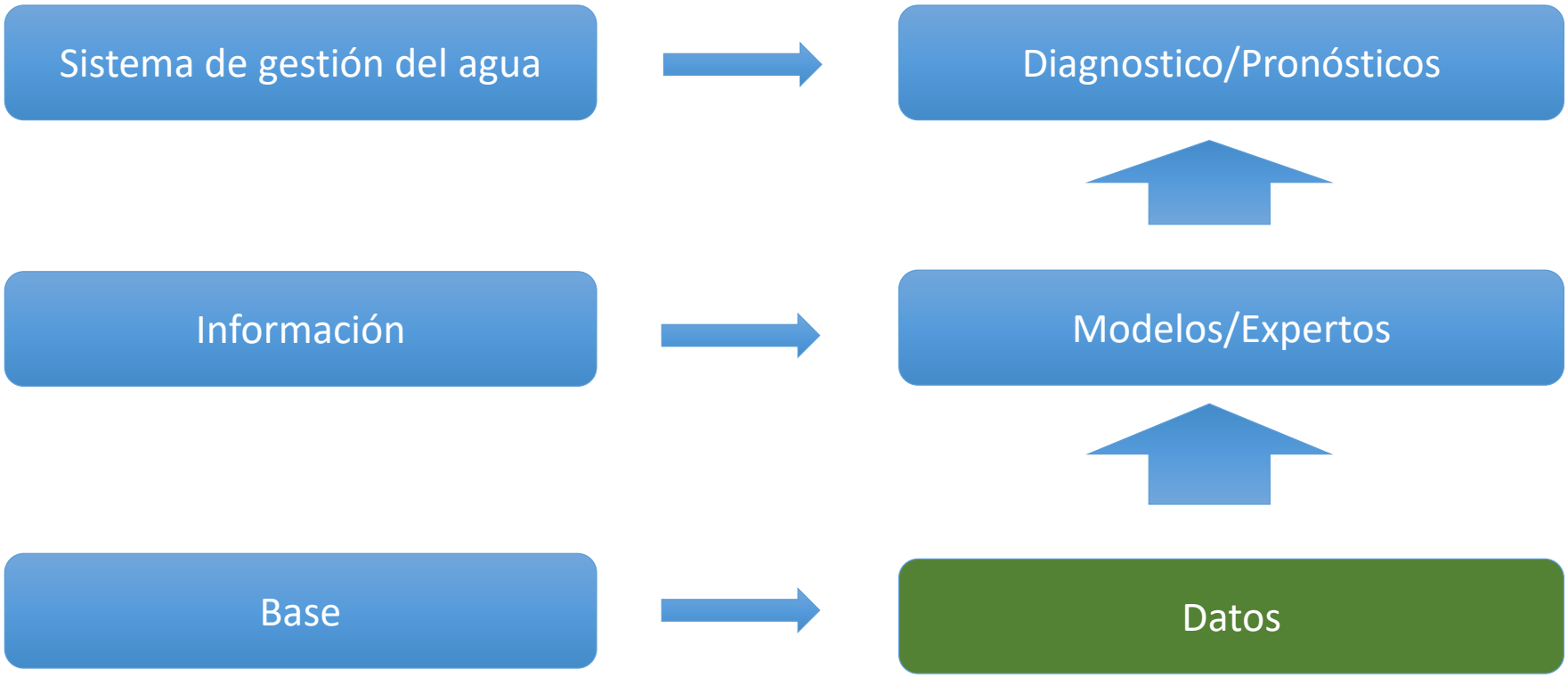
Contexto: Sequías y cambio climático



Impactos

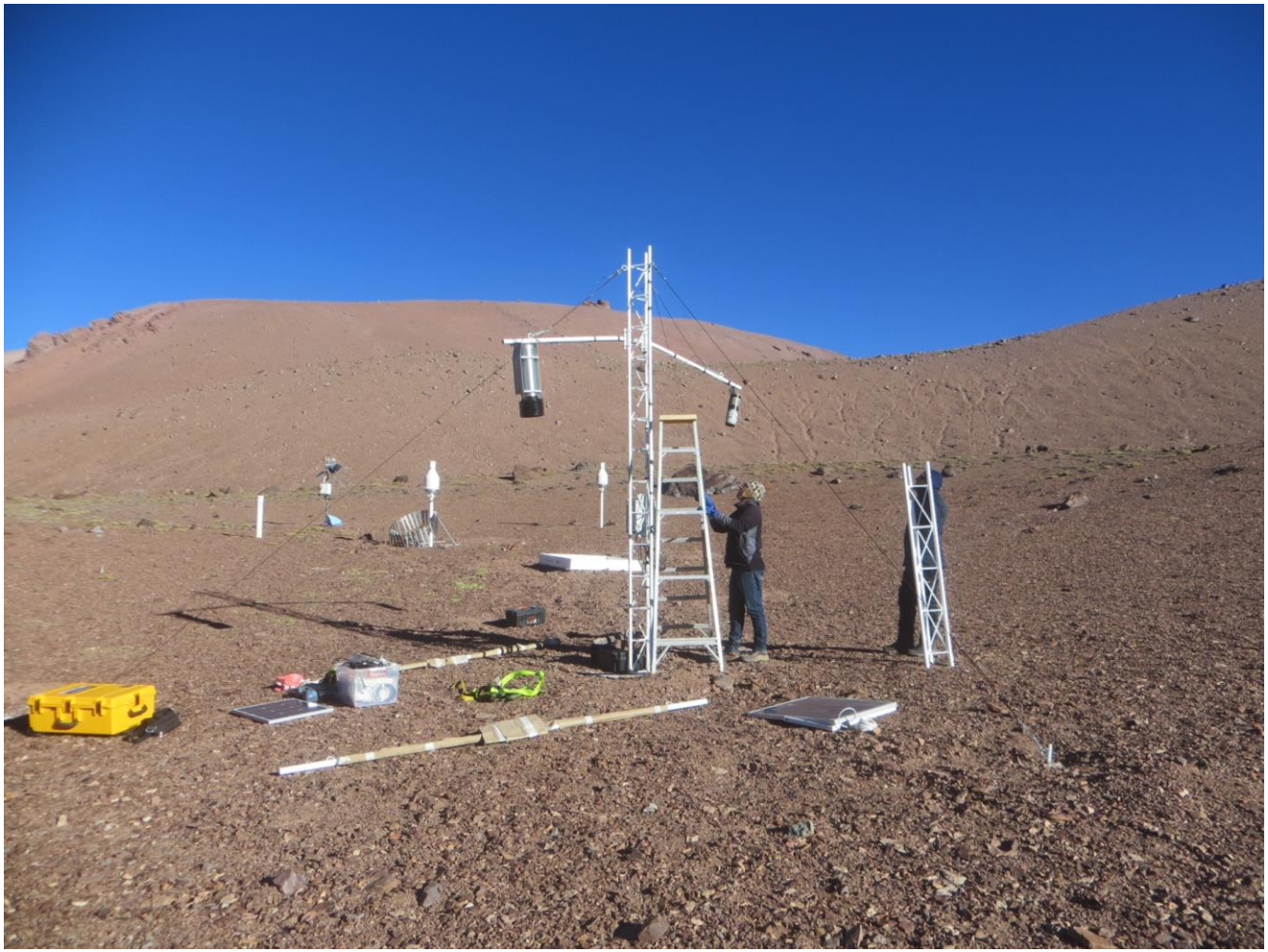
Al fondo el embase La Paloma, abajo de huertos secos, 'toconados' o arrancados de palto, citricos, uva de mesa, etc.

Problema general



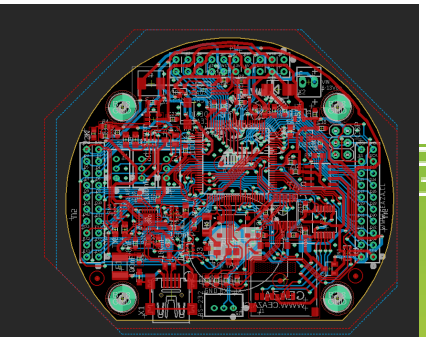
CEAZAmet y monitoreo en altura

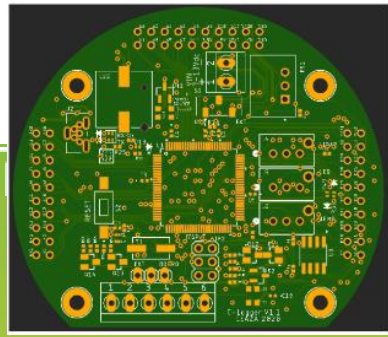
Esto es difícil y caro!!
Pero necesitamos mas



Propuesta (2015 – 2023)

Expansión de la red de telemetría mediante el desarrollo local de hardware avanzado



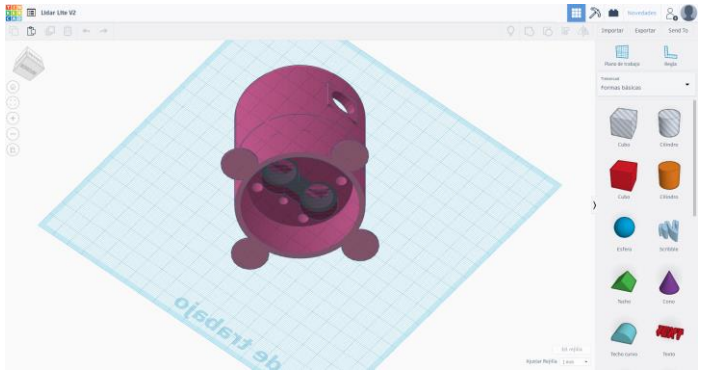


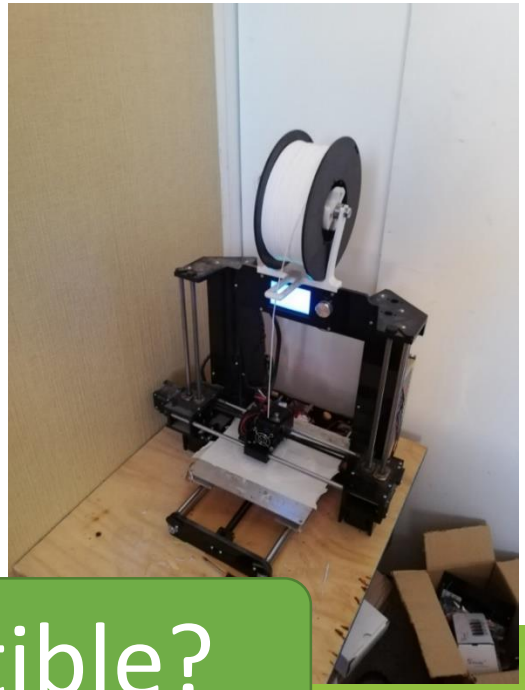
Sistemas de telemetría

Sensor ⇨ Logger ⇨ Comunicaciones ⇨ Disponibilización

Etapa 1: Factibilidad (2015-2018)

Prototipos (2015-2018)





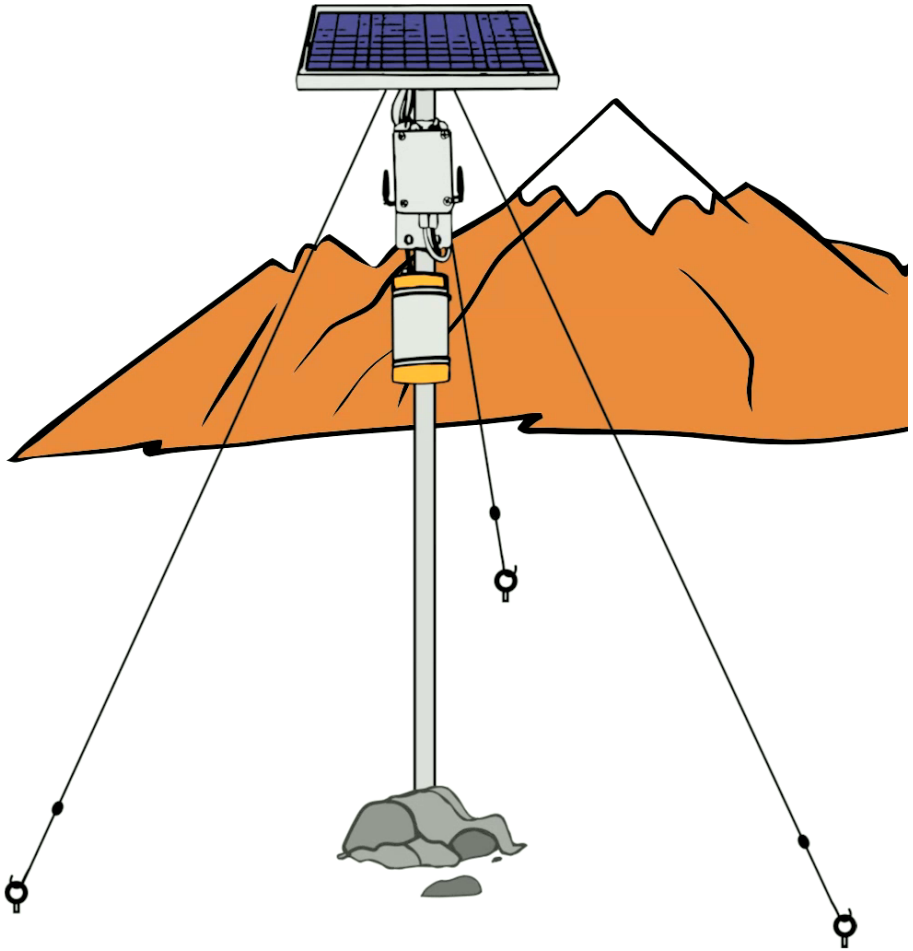
Es factible?

Prototipo 3: Pruebas terreno

Si!!!!

Etapa 2: Desarrollo electrónico (ANID-IDEA 2020)

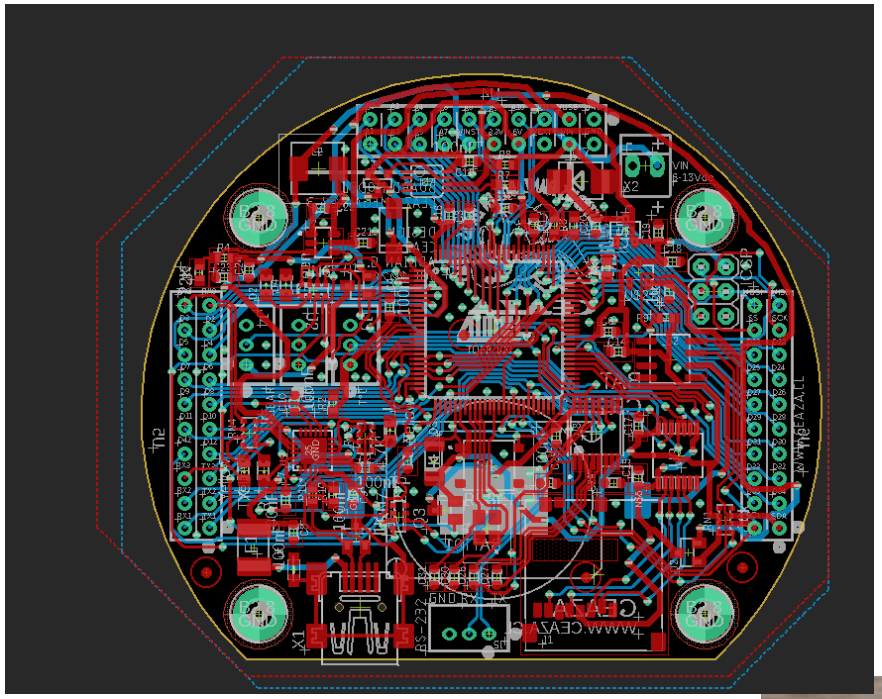
2020-2021: Nodos de altura (V4)

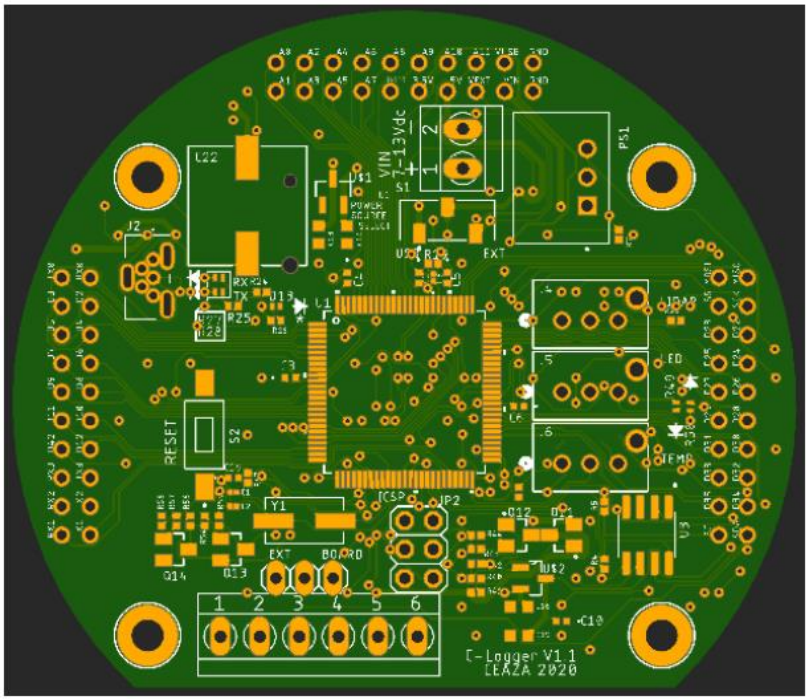


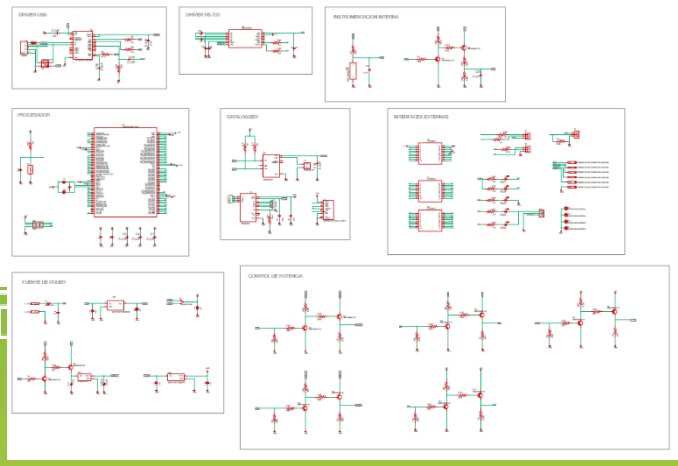
- Bajo costo
- Bajo peso
- Bajo tamaño
- Bajo consumo

Sistemas a medida

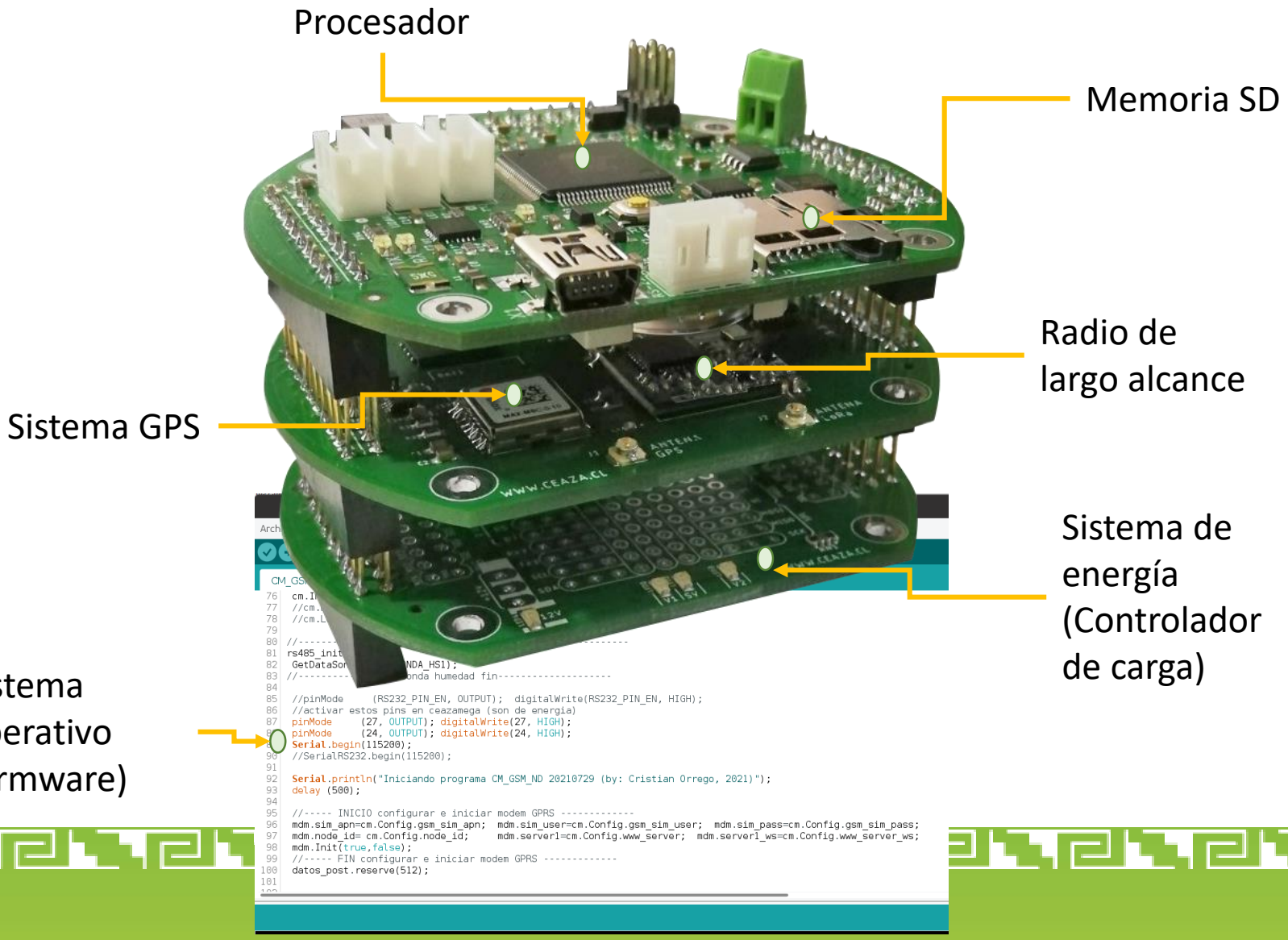
2020-2021: Nodos de altura, hardware



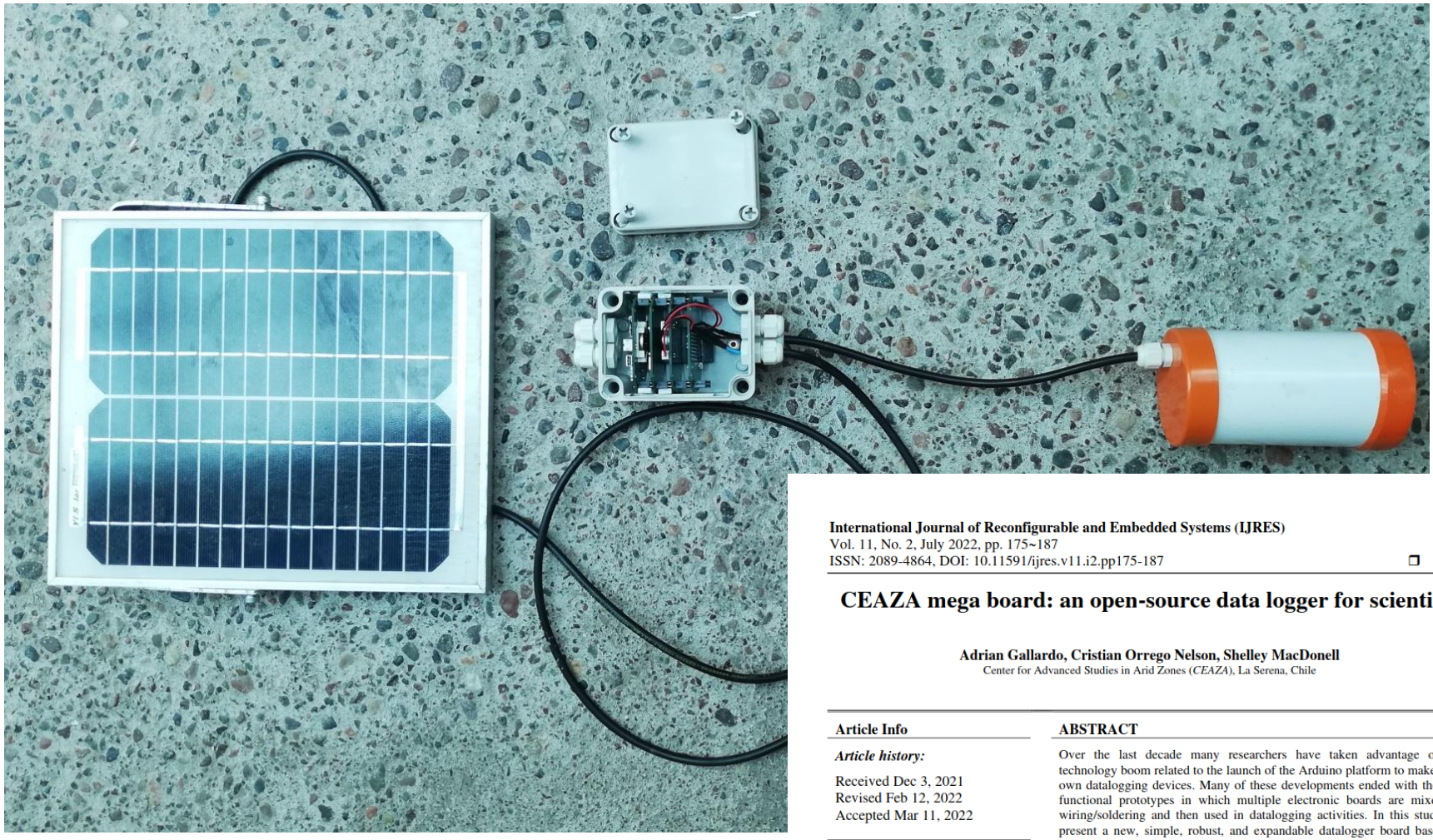




2020-2021: Nodos de altura, hardware



2021: Nodos de altura, fabricación



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CEAZA mega board: an open-source data logger for scientists

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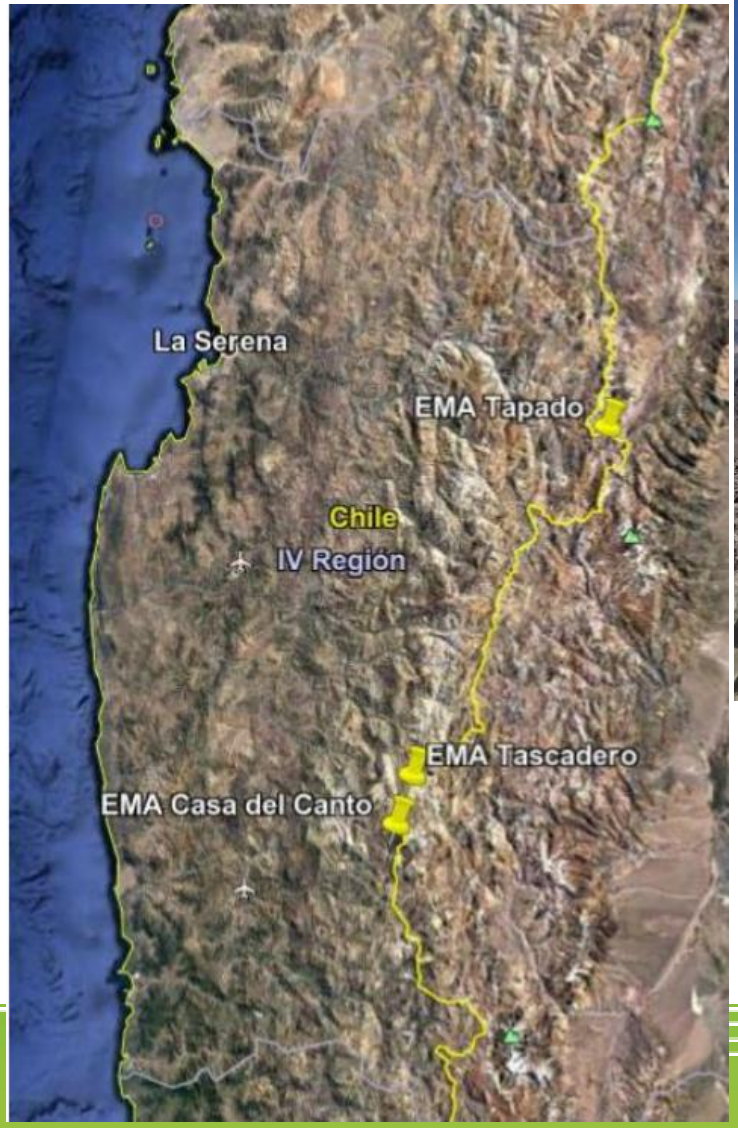
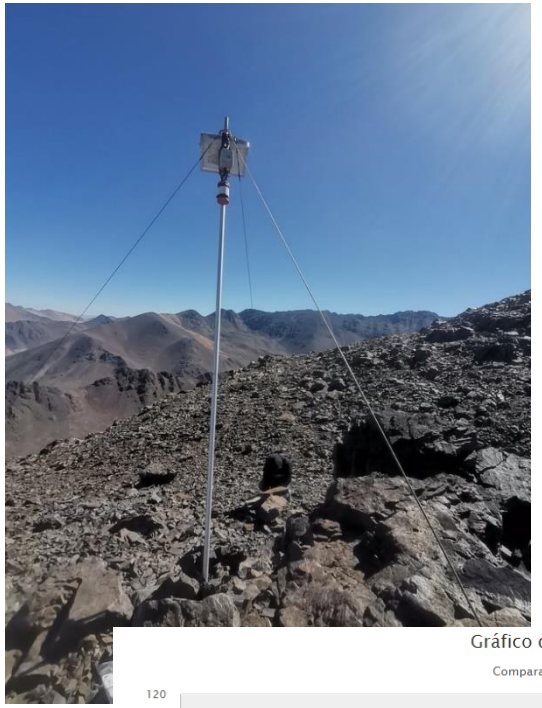
Embedded system
Environmental monitoring
Open source
Science

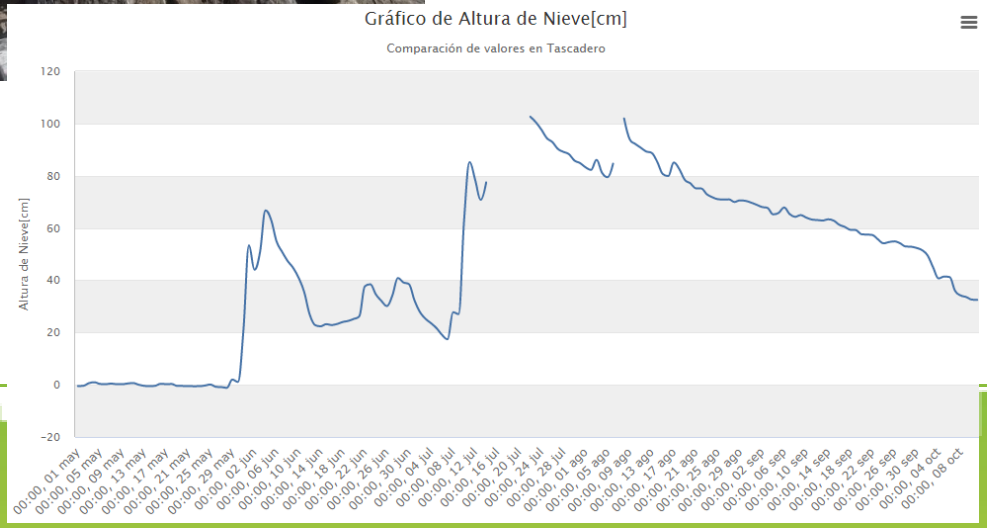
ABSTRACT

Over the last decade many researchers have taken advantage of the technology boom related to the launch of the Arduino platform to make their own datalogging devices. Many of these developments ended with the first functional prototypes in which multiple electronic boards are mixed by wiring/soldering and then used in datalogging activities. In this study we present a new, simple, robust, and expandable datalogger board based on maker's community integrations. Our datalogger board extends previous work in this area as we designed an Arduino Mega 2560 derivative integrated board that is compatible with existing developments but was also designed and implemented considering requirements such as low power consumption, expandability, and integration. Different tests were made so reliability in low temperatures and low energy needs are satisfied. Is expected that the scientific community can add this board to their tool set, as this board solves the energy problem and present an easy transition from handmade logger integrations.

2021: Nodos de altura, pruebas



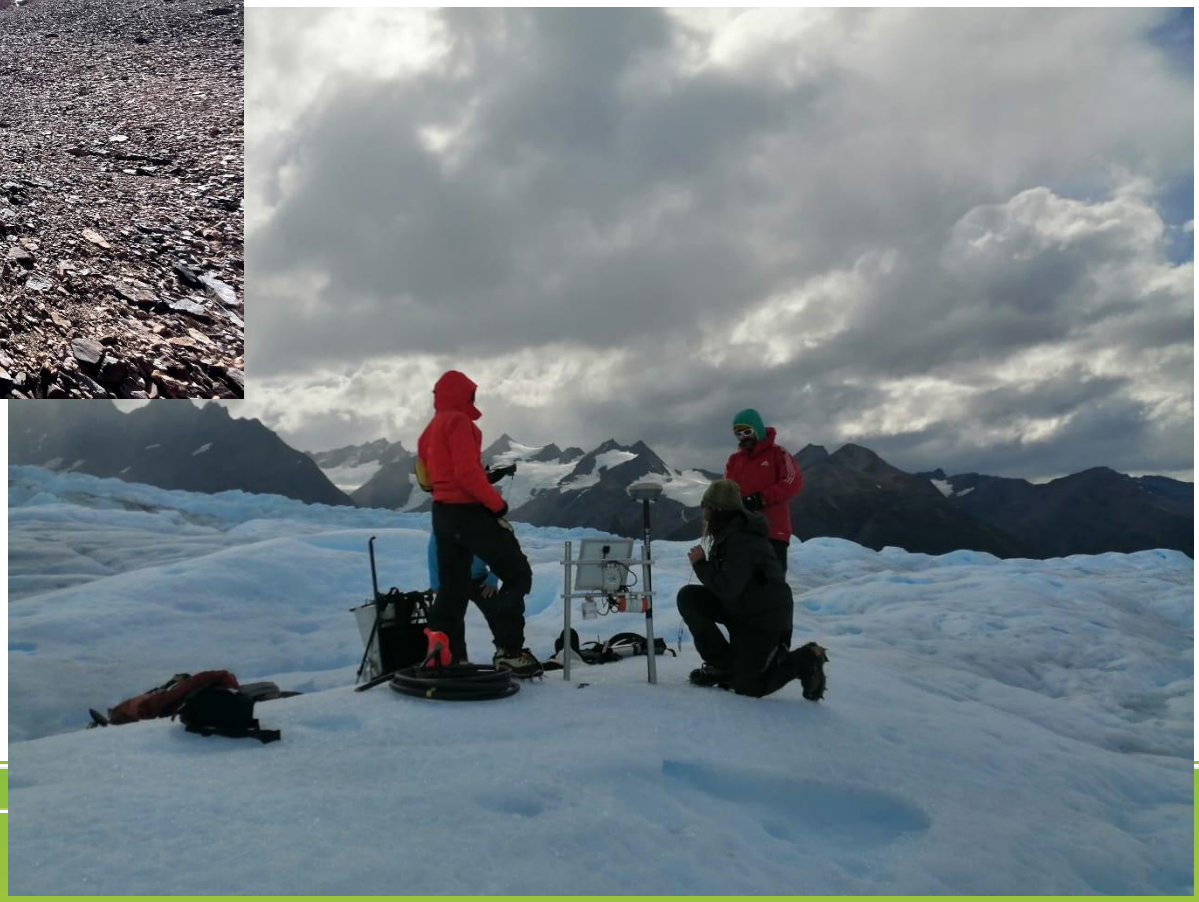




2021: Nodos de altura, transferencia

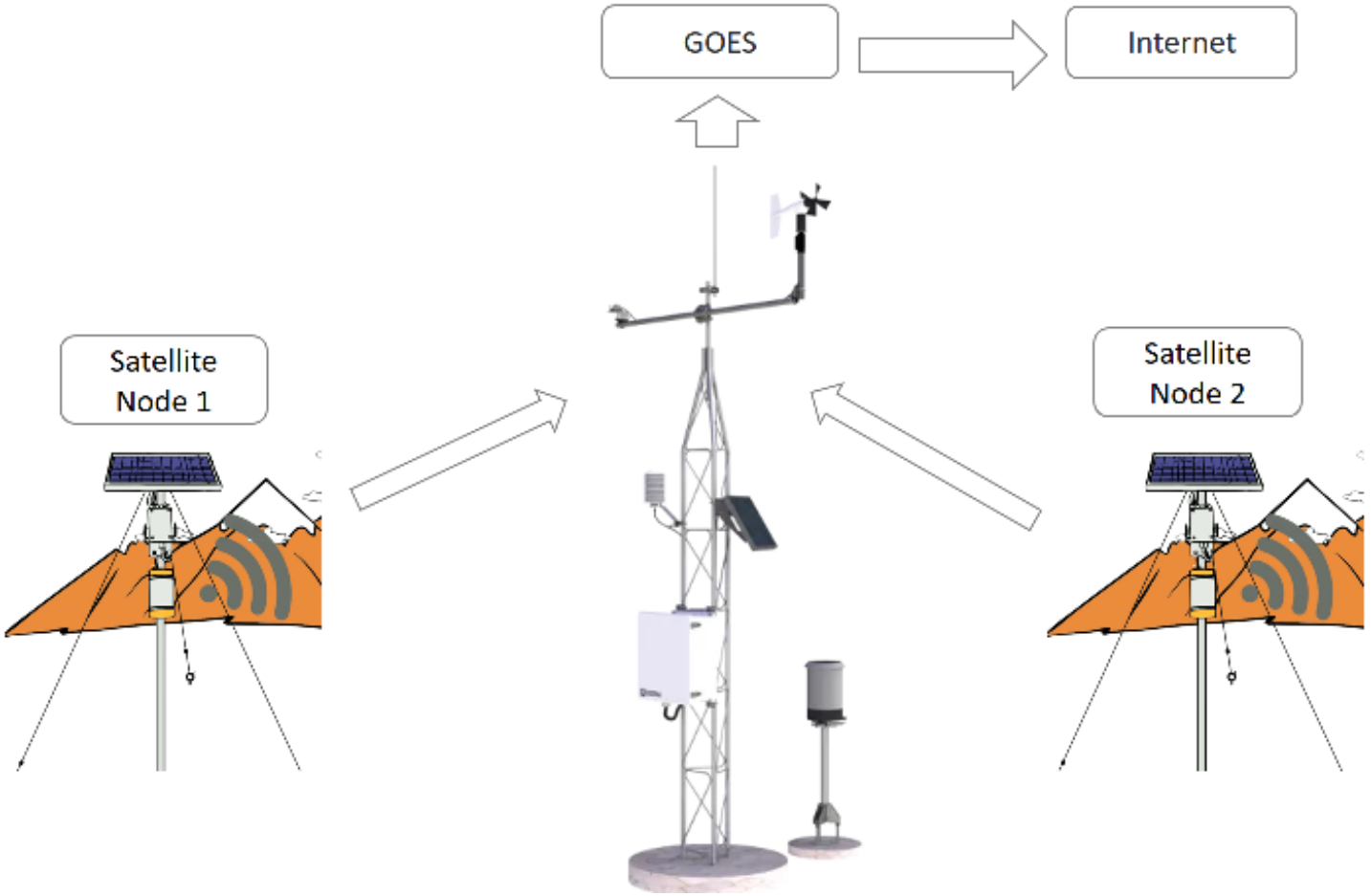
Glaciología CEAZA,
Glaciar El Tapado

Glaciología IANIGLA,
Glaciar Perito Moreno



Etapa 3: Mejorando los TRL (ANID-IDEA, 2022-2024)

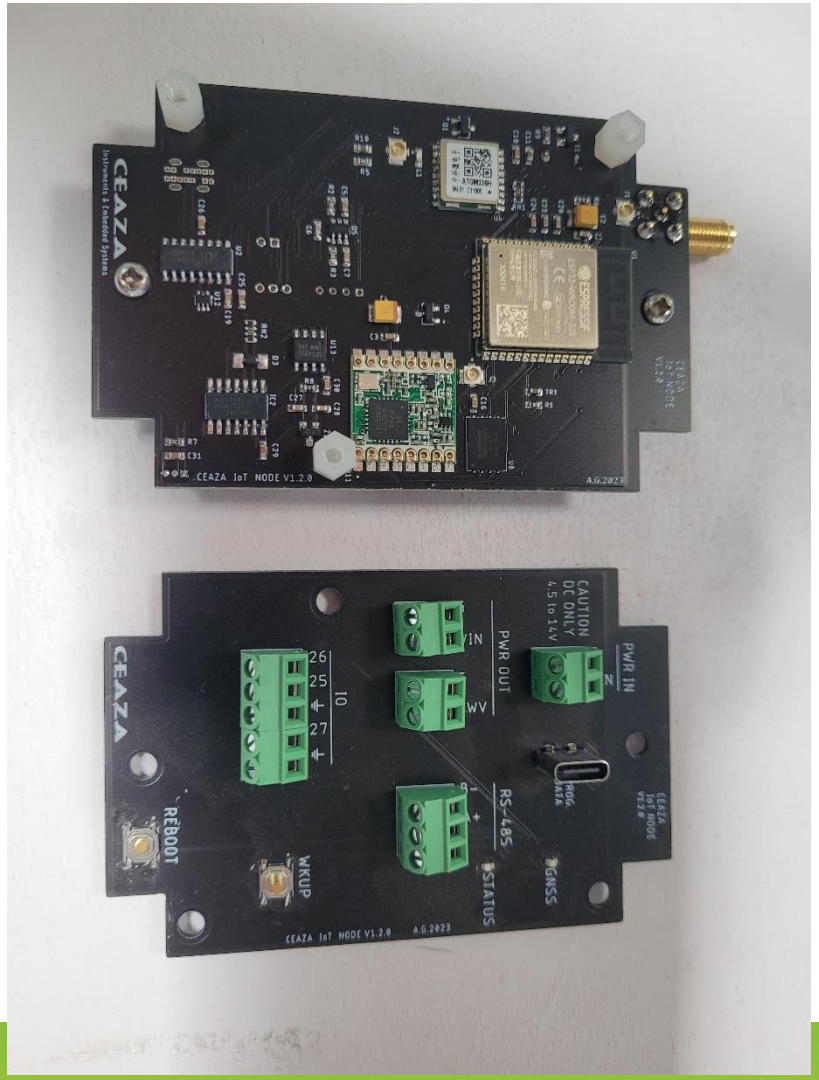
Objetivo: Red nival de bajo costo



Datalogger

Lectura
Almacenamiento
Transmision

Electrónica/Placa/Caja



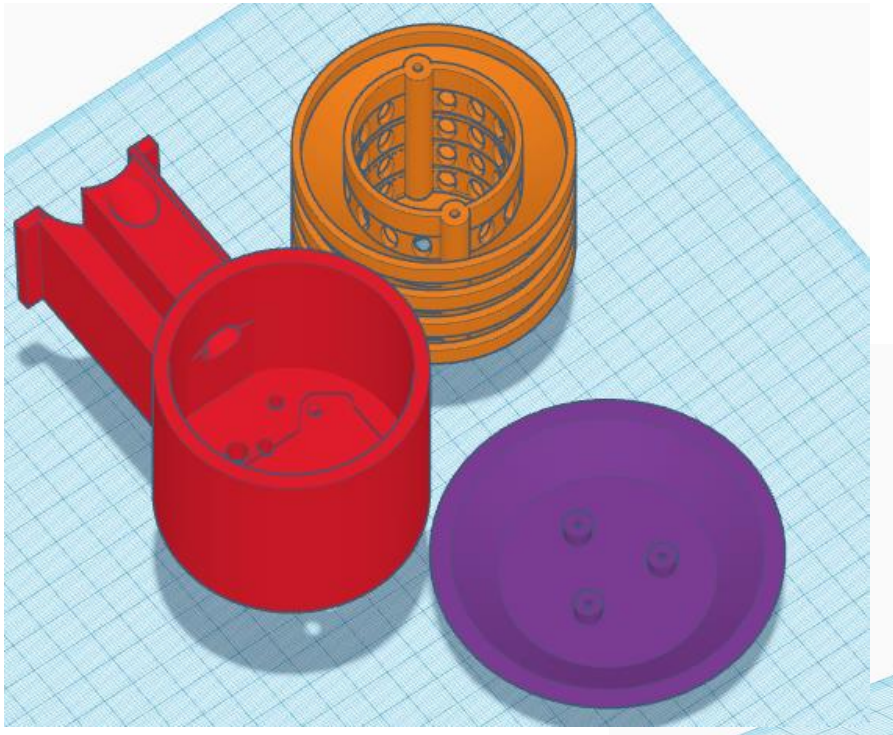
Firmware

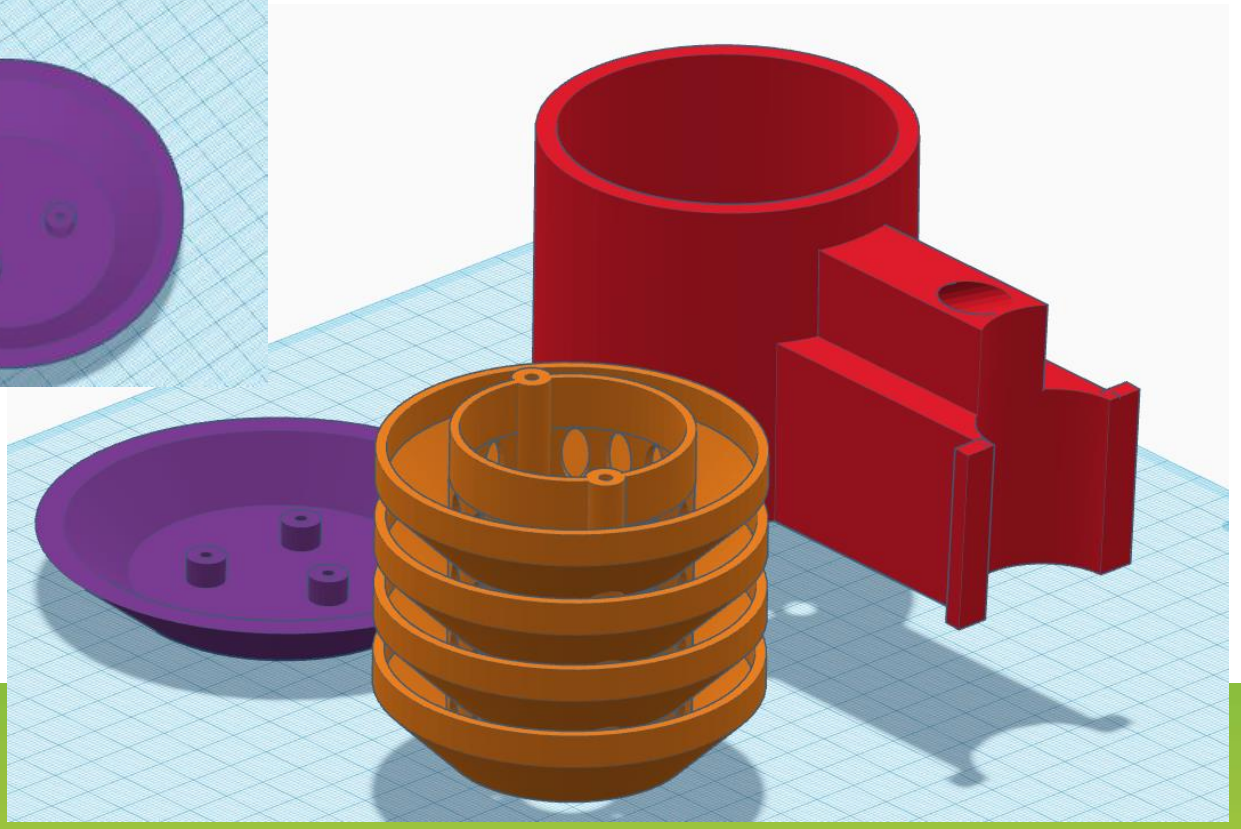
IOTNode1.2v2023.11.08B.ino

```
48  #define BUZZER_PIN   32
49  #define BUZZER_PIN_ON HIGH
50
51  #define HALL_SENS_PIN   33
52  #define HALL_SENS_PIN_ON   false
53  RTC_DATA_ATTR bool hallSensorFlag = false;
54  RTC_DATA_ATTR float gps_lat = 0.0;
55  RTC_DATA_ATTR float gps_lon = 0.0;
56  RTC_DATA_ATTR float gps_alt = 0.0;
57
58  RTC_DATA_ATTR bool swarm_modem_exists = false;
59
60  void IRAM_ATTR ISR() {hallSensorFlag = true; }
61
62
63  #define STATUS_LED_PIN   0
64  #define SW_VIN_PIN 5
65  #define SW_VIN_PIN_ON HIGH
66  #define V_MONITOR_PIN 34
67  #define VmonitorDiv      151.5
68  #define VmonitorOffSet   1.4
69
70  #define uS_TO_S_FACTOR 1000000  /* Conversion factor for micro seconds to seconds */
71
72
73  //---------- inicio GPS ----------
74  #define GPS_POW_PIN            2
75  #define GPS_POW_PIN_ON       LOW
76  #define GPS_TX_PIN            14
77  #define GPS_RX_PIN            39
78  #define SerialGPS   Serial1
79  //---------- fin GPS ----------
80
81  //---------- inicio 485 --------------------
82  #define TXD2_PIN              17
```

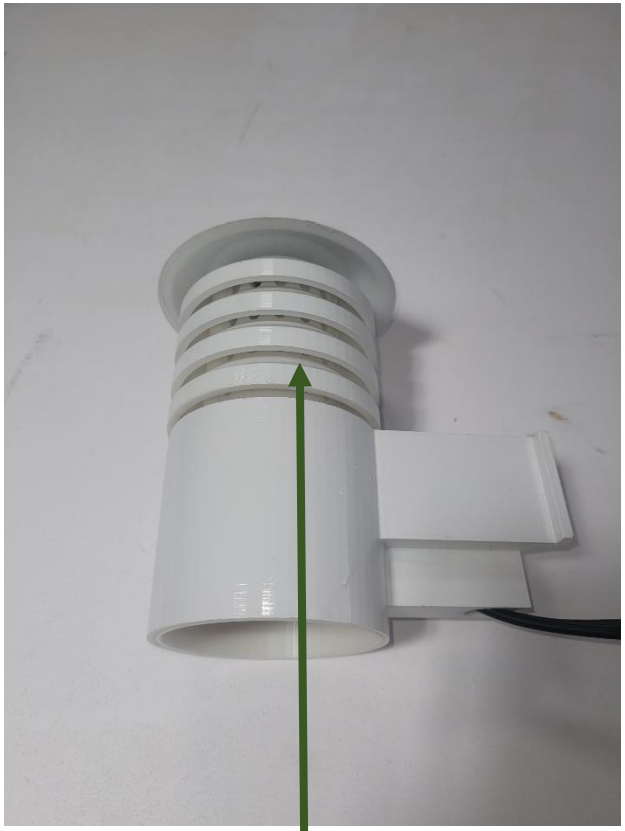
Temperatura y altura de nieve

Desarrollo de sensores: Diseño 3D

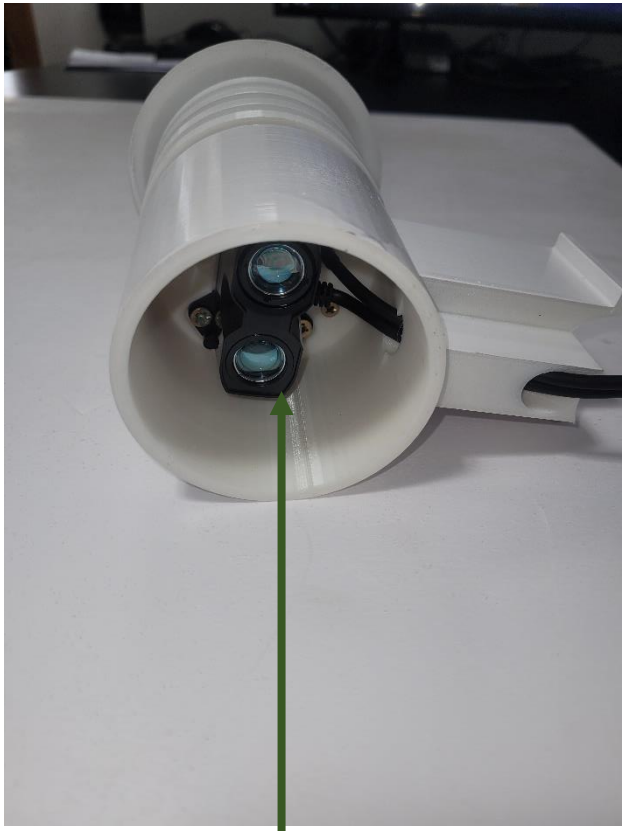




Desarrollo de sensores: Diseño 3D



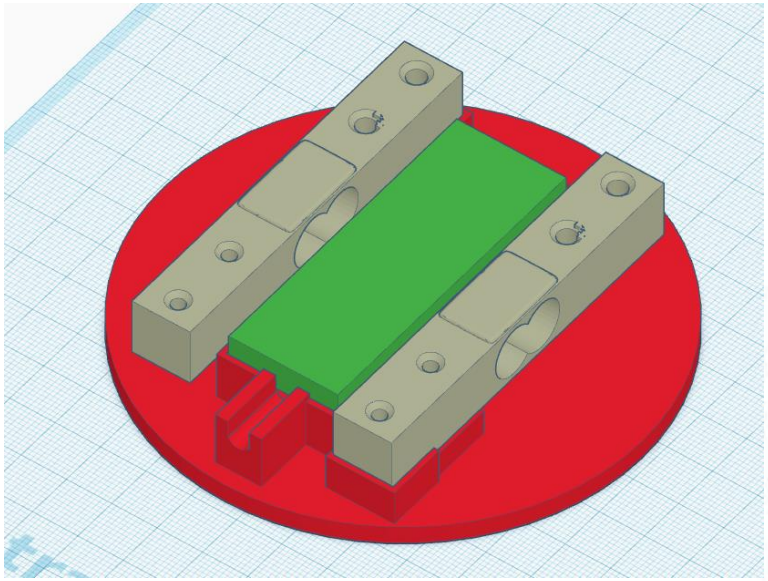
Temperatura



Altura de nieve

Pesa de nieve

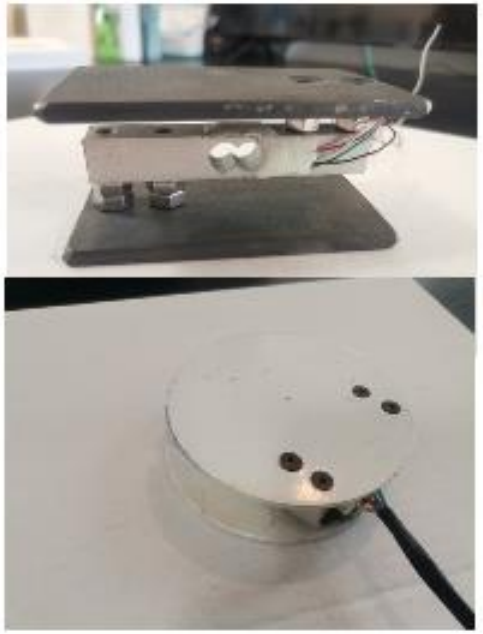
Primeros prototipos

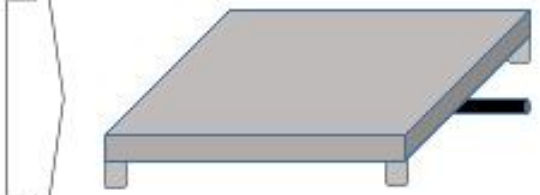


Technological development of Snow Scale Sensor

Proof of concept
(2020-2011)

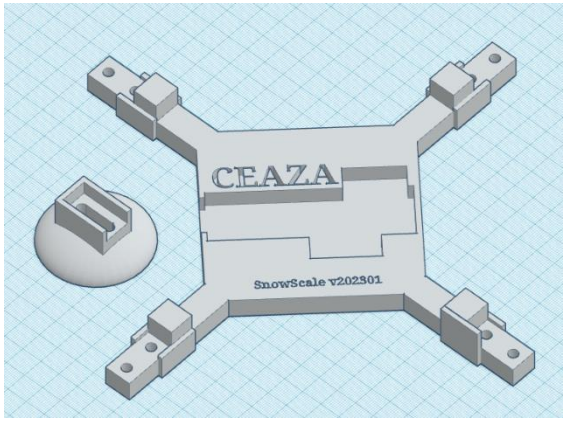
CEAZAscale V1
(2022/25)

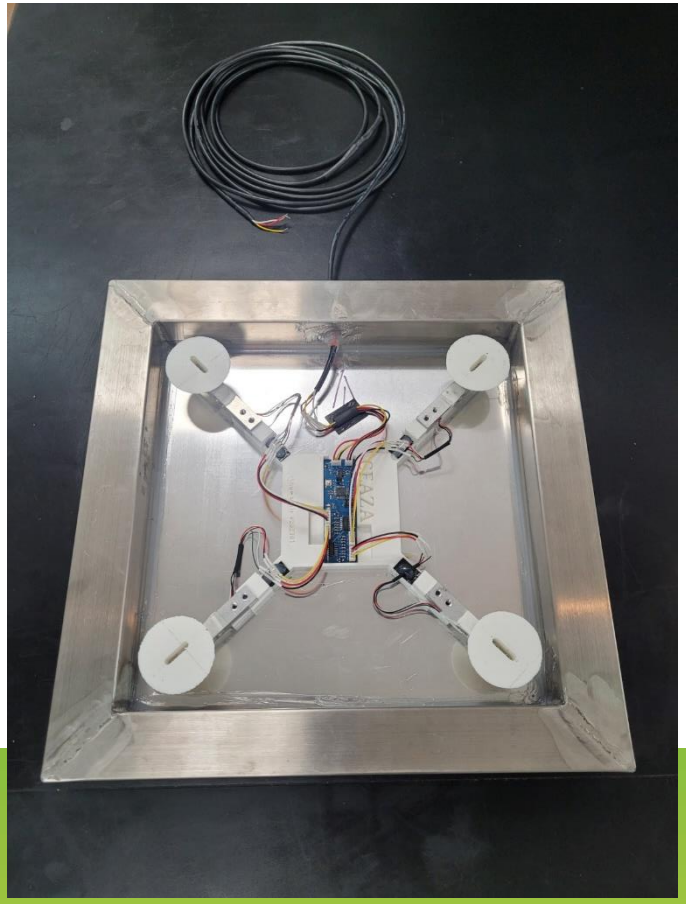




Compact and low-cost
snow scale sensor

Desarrollo de sensores

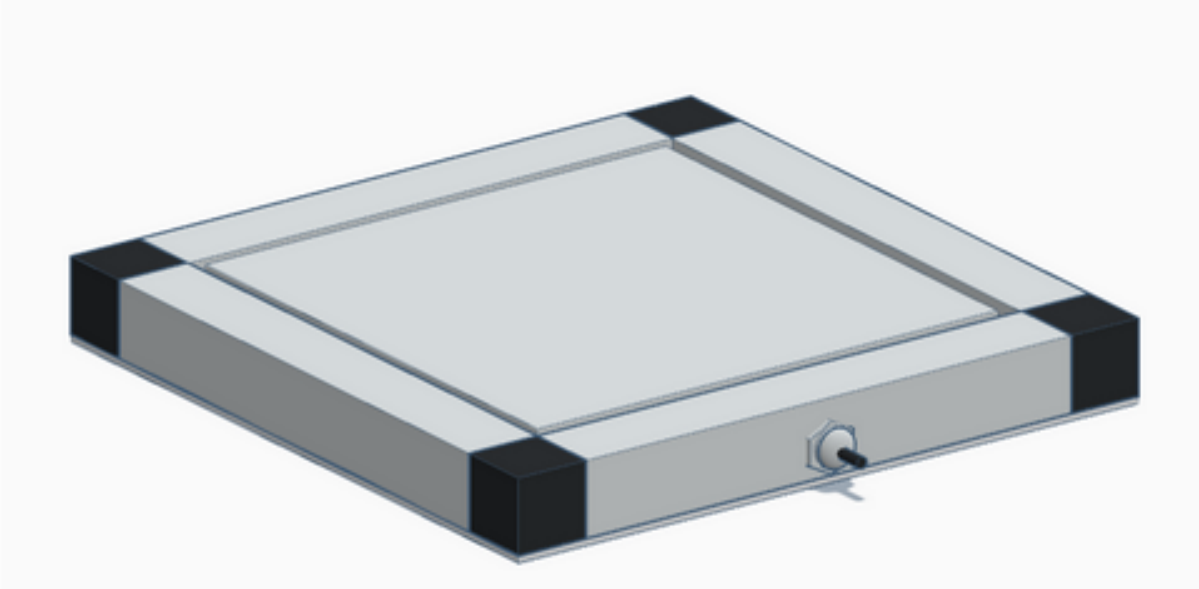




Desarrollo de sensores

SnowScale Mini V0.3

SWE Sensor

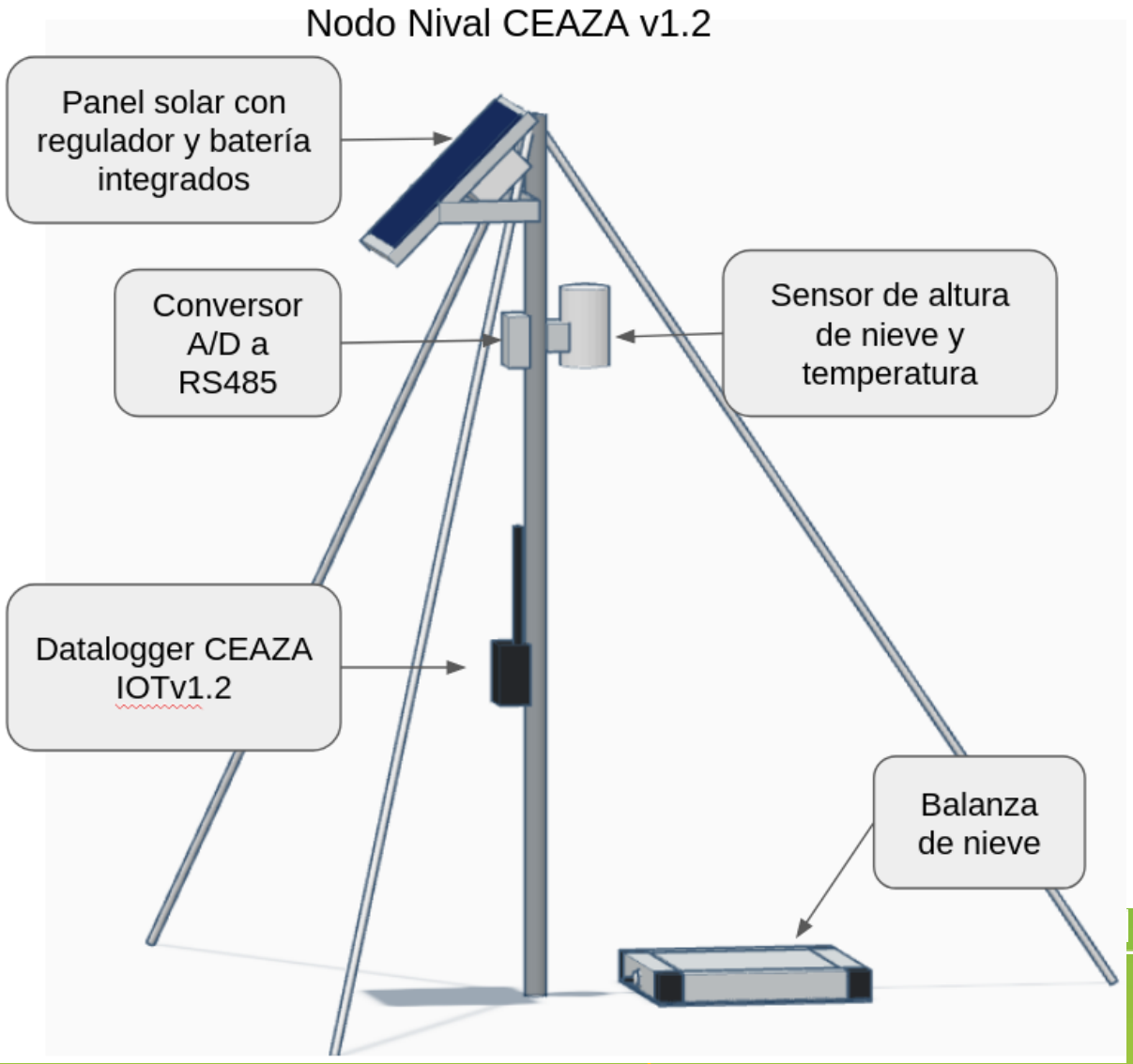


This prototype is a Mini SnowScale of measuring area of 25x25cm. Can be used in any situation where conventional Snow Scales are not feassible (budget or space constrains)

Energy efficient and RS485 comunications. Atmel 328P SoC based and 0 to 40kg weight capabilities.

Armado

Sistemas integrados

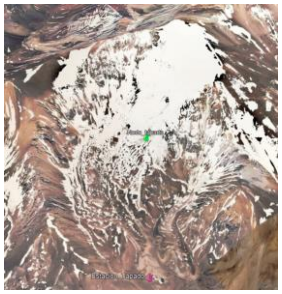


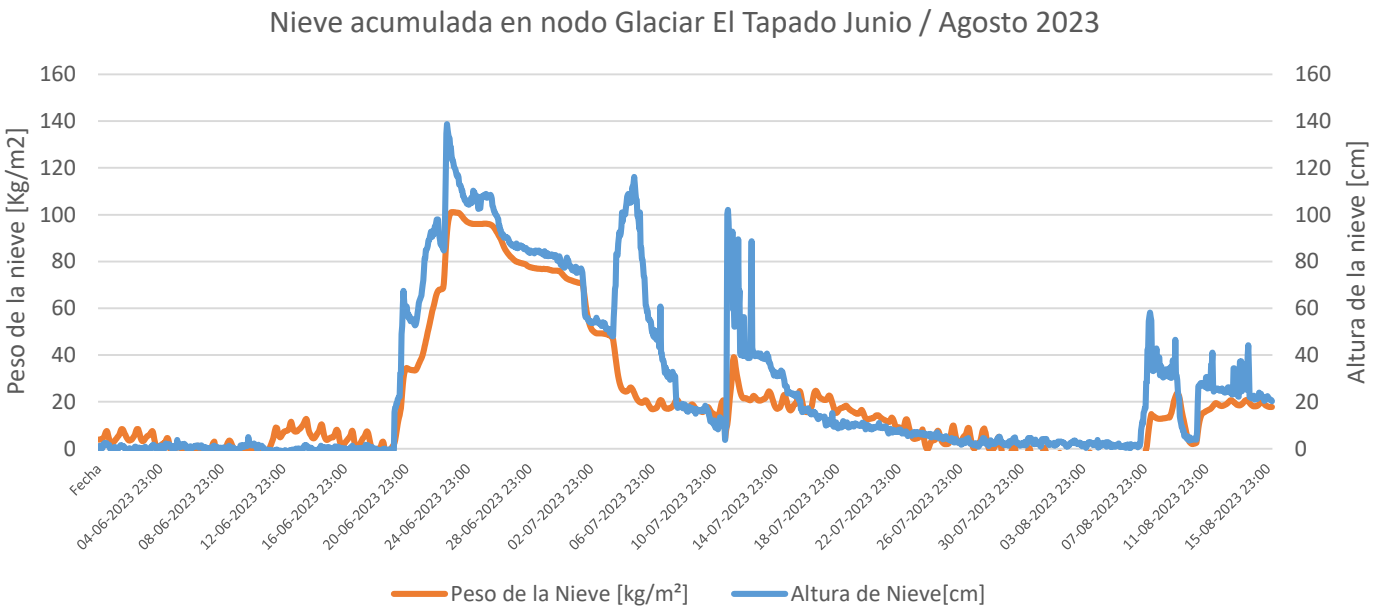
Instalación

Datos

Nodo en falda de glaciar El Tapado

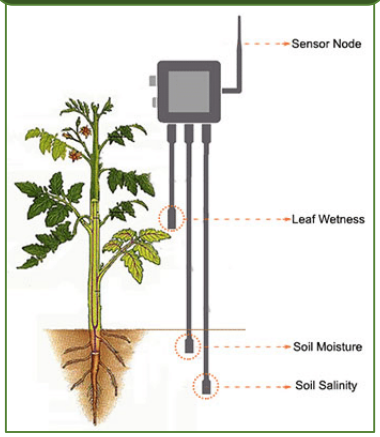
Altitud: 4500 m.s.n.m.
Equipamiento: Datalogger, panel solar, altura de nieve, balanza de nieve, termómetro (no operativo)





Y también para el agro (IOT)..

Diagnóstico



Sensor

Logger

Comms

App

Web

Control

Actuador

Logger

Comms 2

Desde la mirada del pequeño agricultor

Fin…

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