



Alioli ROV Submarine Drone



Juanmi Taboada

Ubuntu Summit 2023

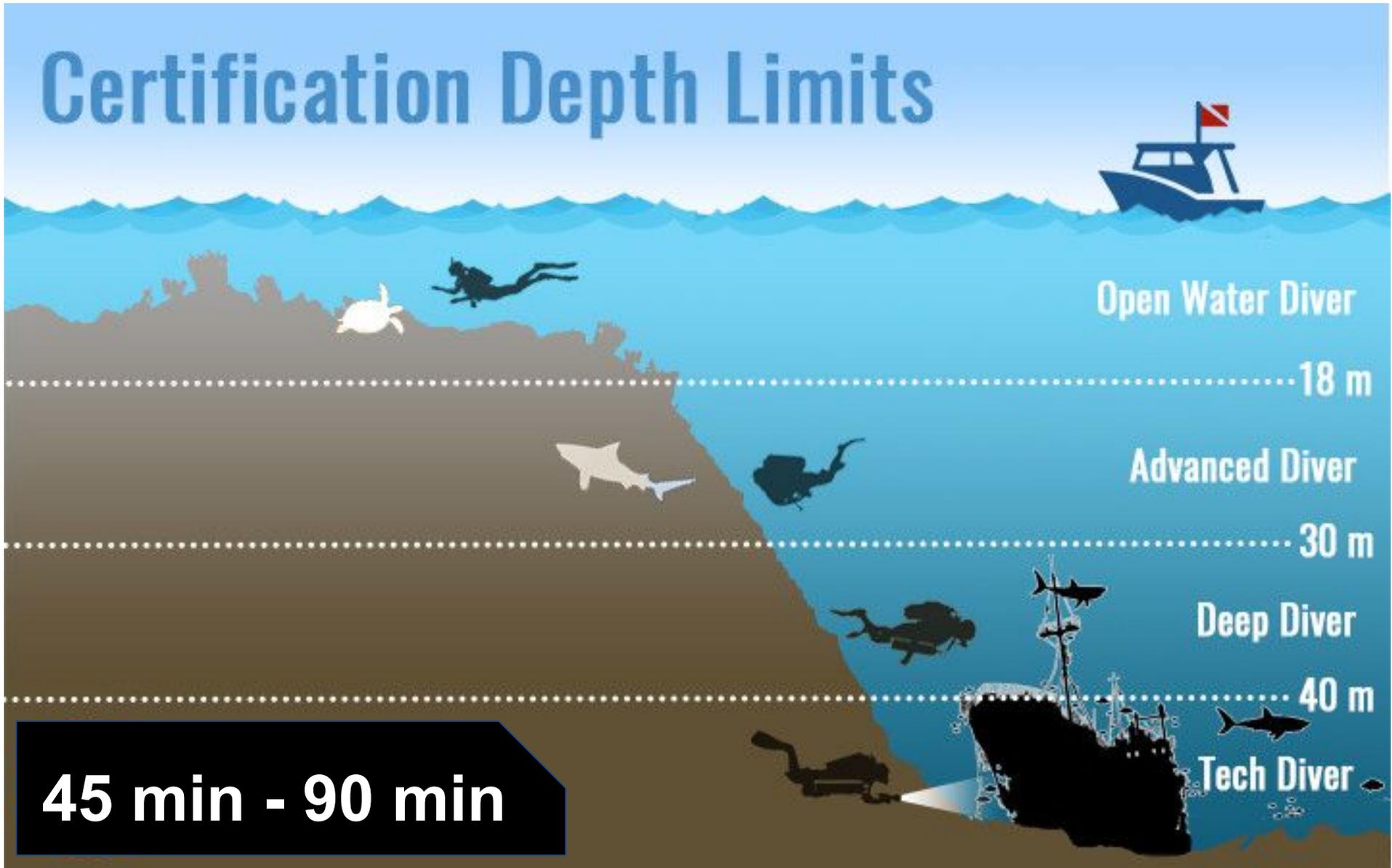
Riga, 3 November 2023



Juanmi Taboada



Certification Depth Limits



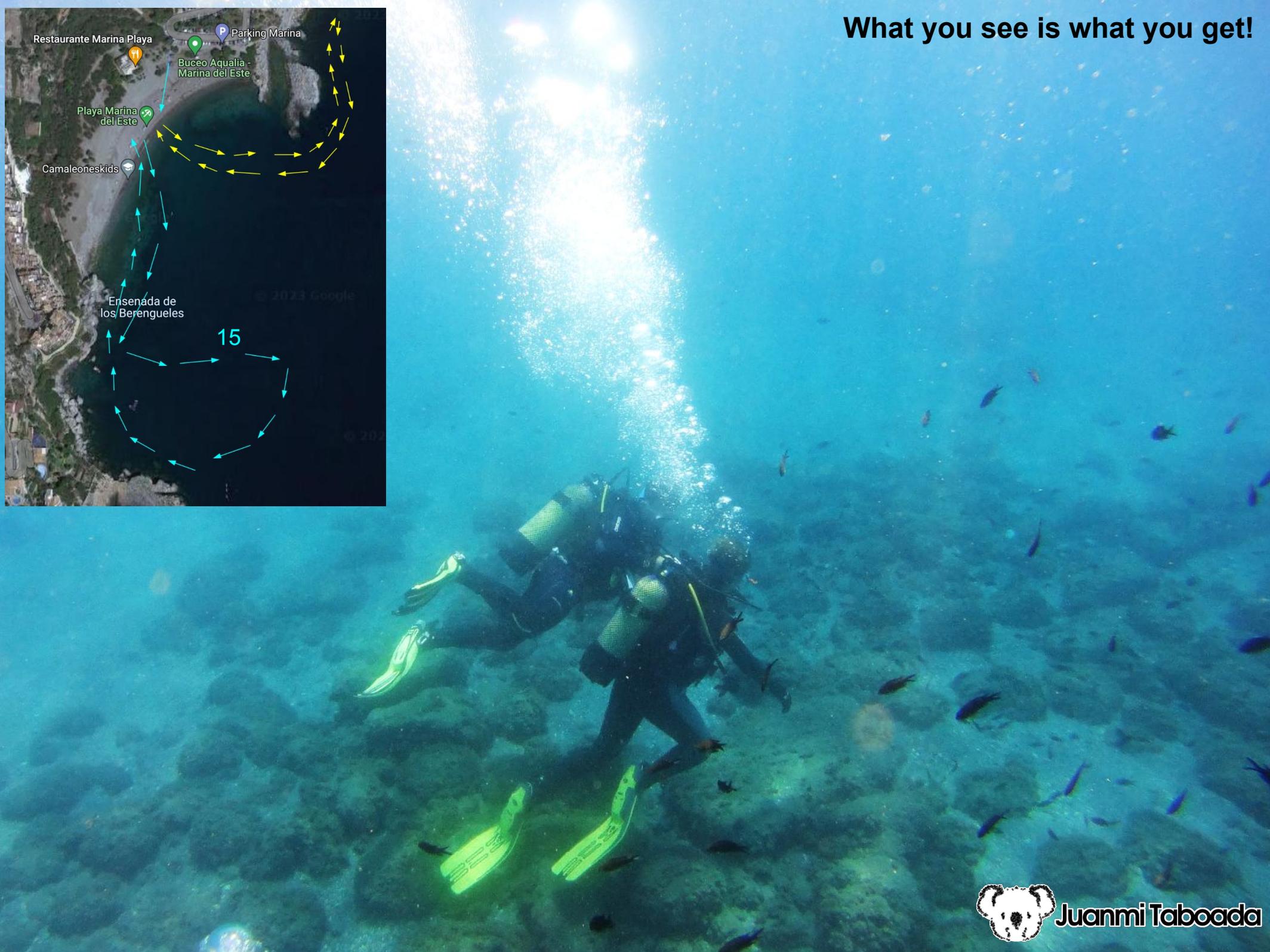
45 min - 90 min



You better make a plan!



What you see is what you get!



Sometimes it is just blue !

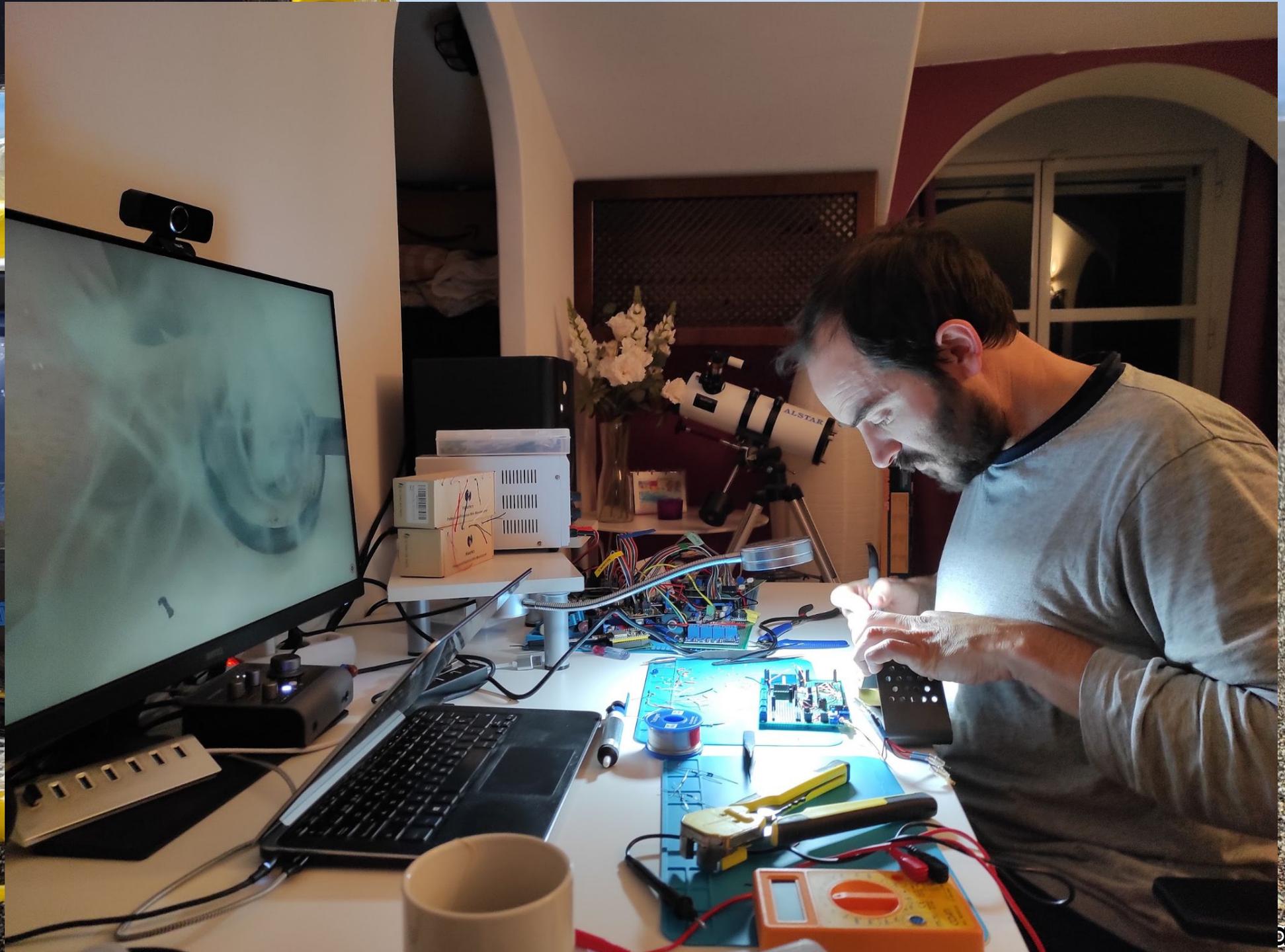




[openMosix Computation Cluster](#)

2001 -> 16 computers
2002 -> 15 computers 2002
@University of Málaga 

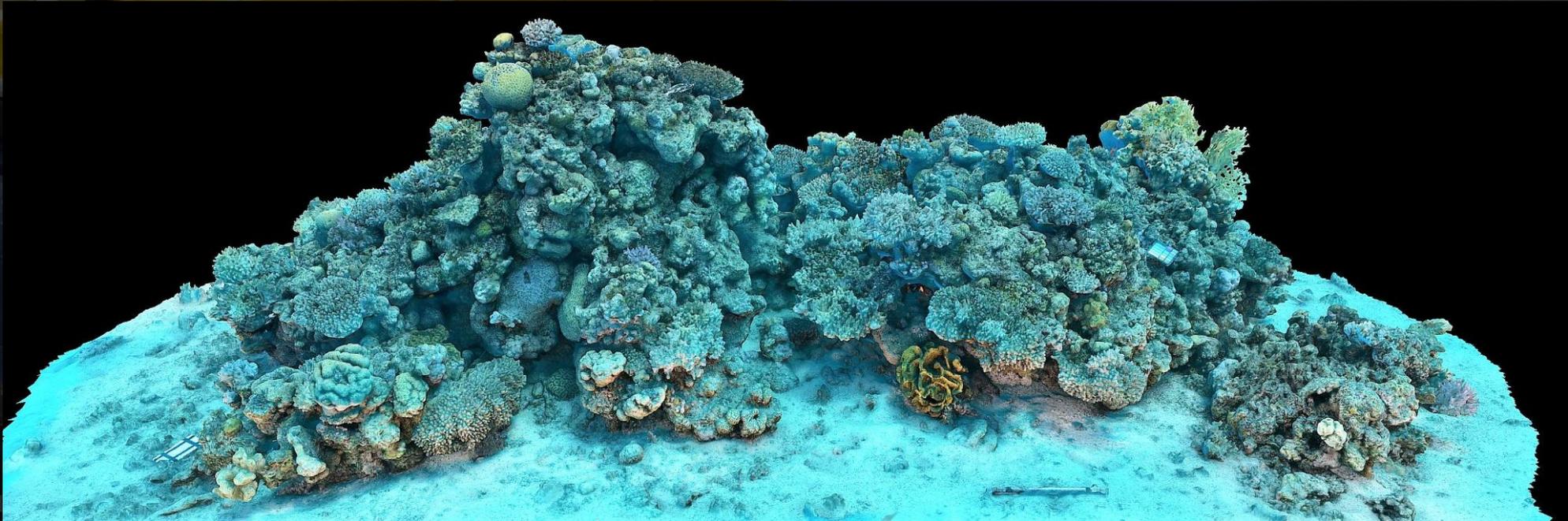
Passion for researching and learning

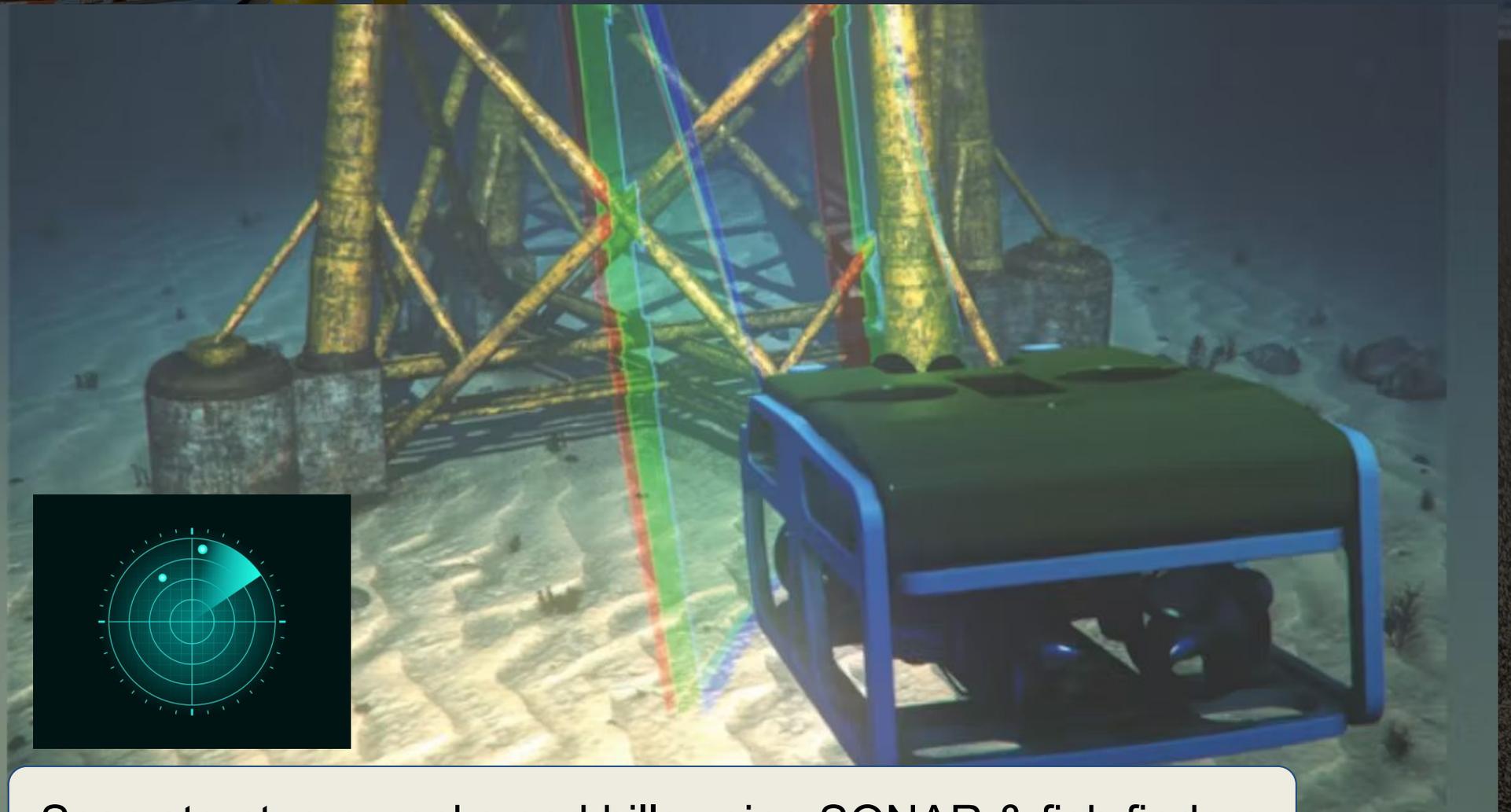




Málaga Wireless 2003 @ La Térmica
Research, Learn & Share

The main concept 💡

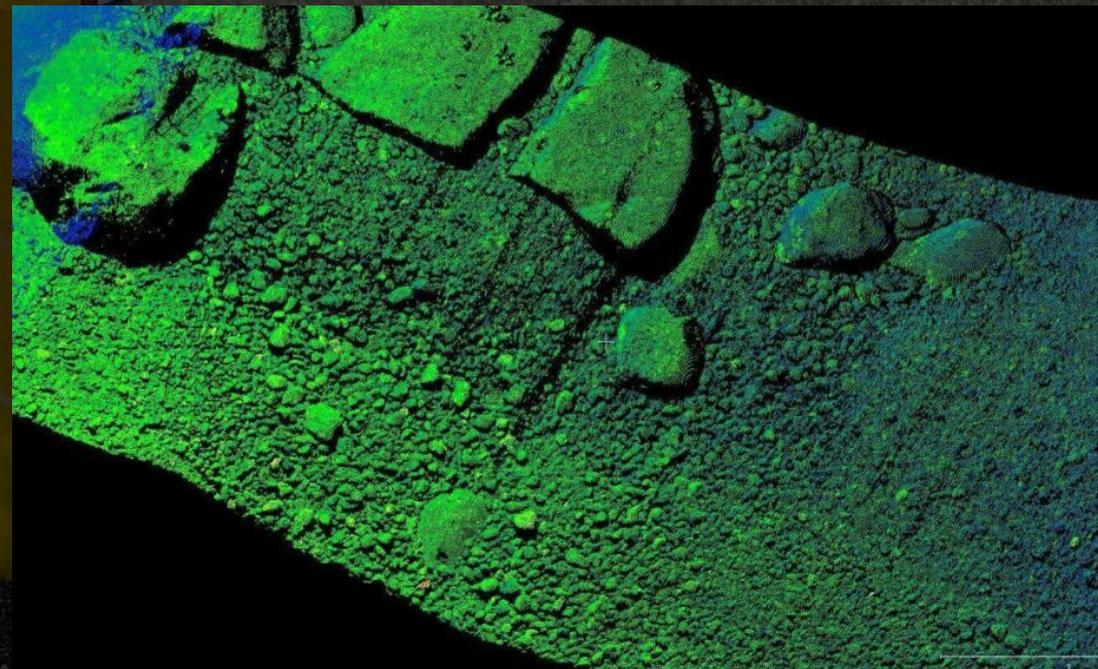
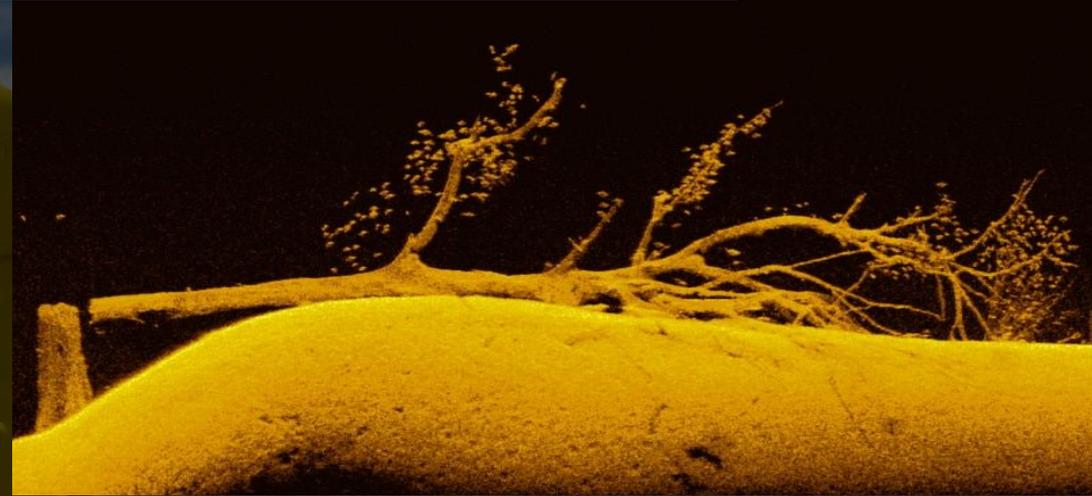
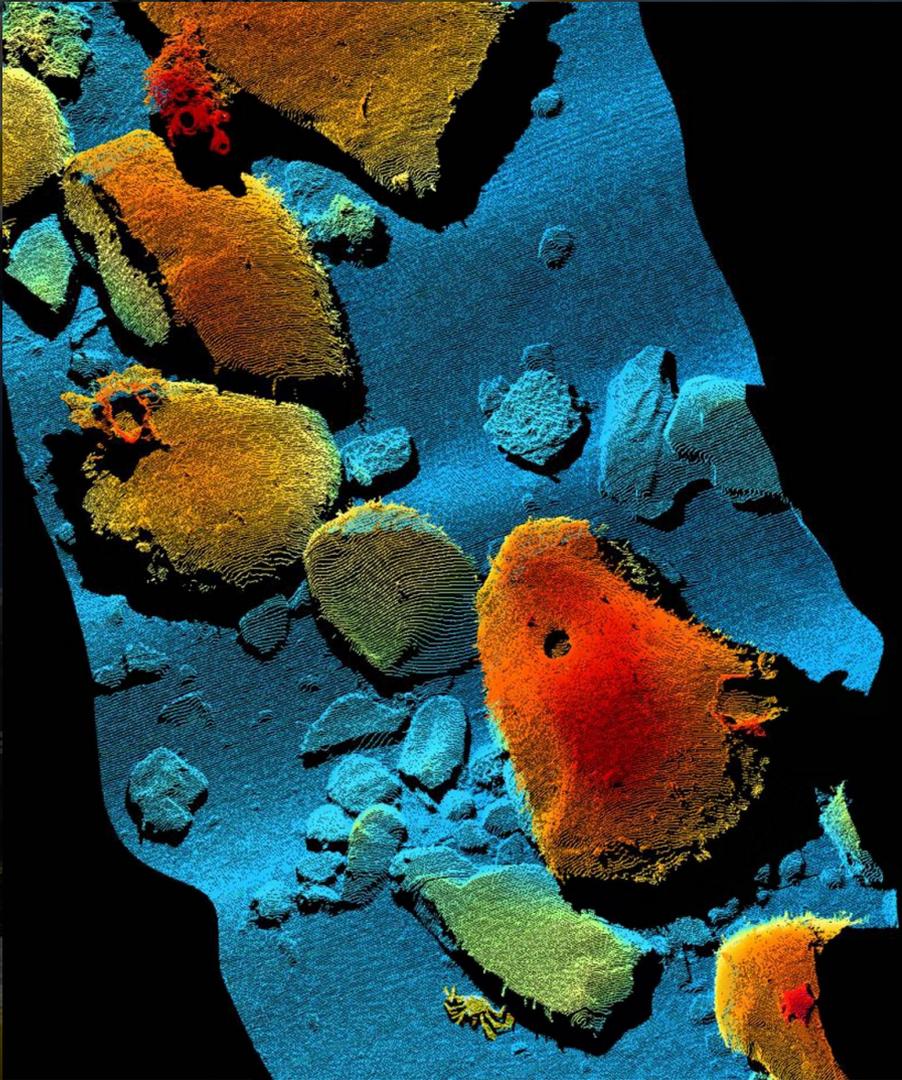




Scan structures, rocks and hills using SONAR & fish finders



Difficult to postprocess & big amount of electricity
(doesn't meet the low consumption approach)

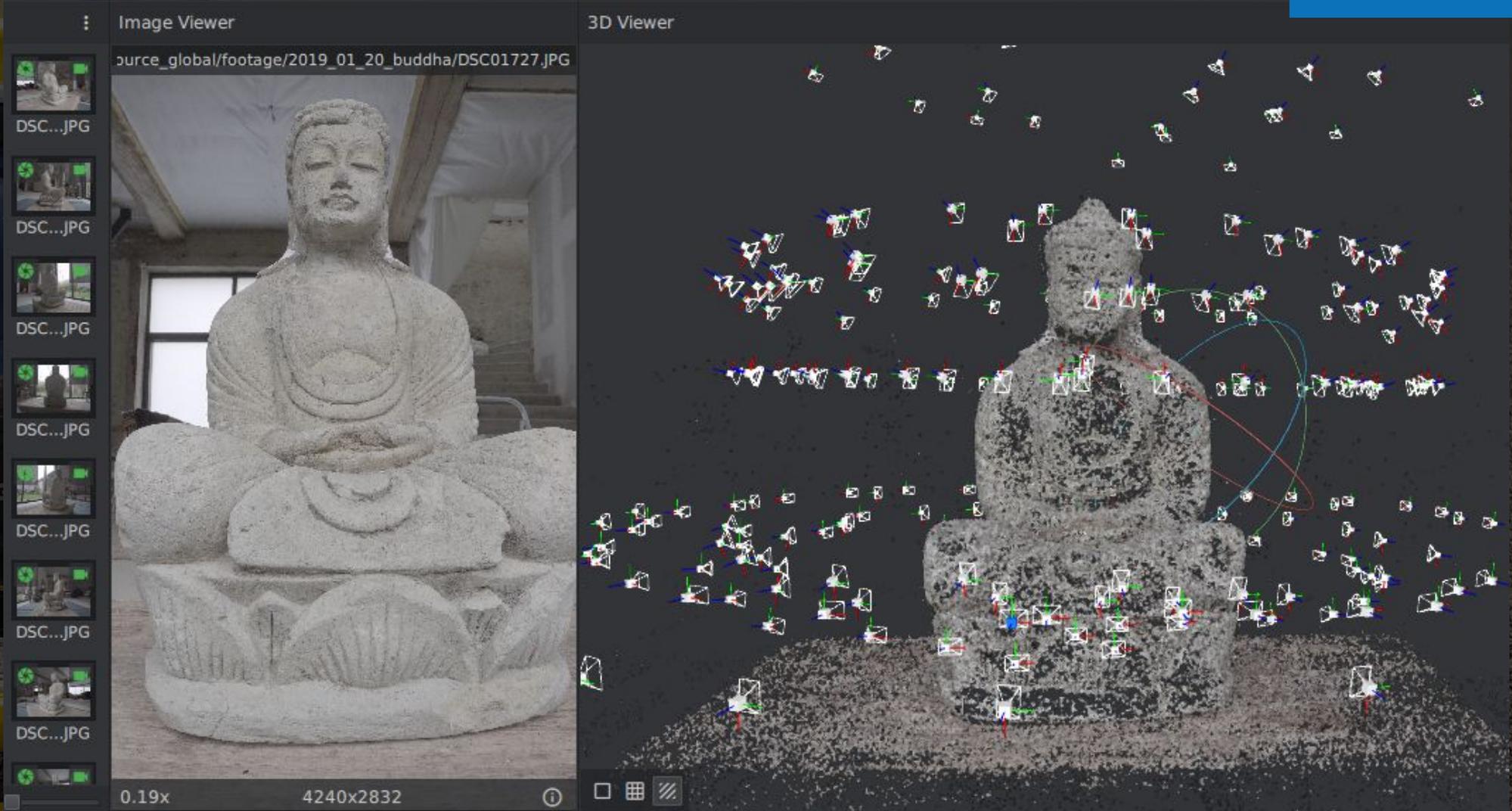


Meshroom

Meshroom is a free, open-source 3D Reconstruction Software based on the **AliceVision** Photogrammetric Computer Vision framework



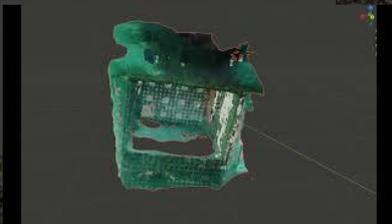
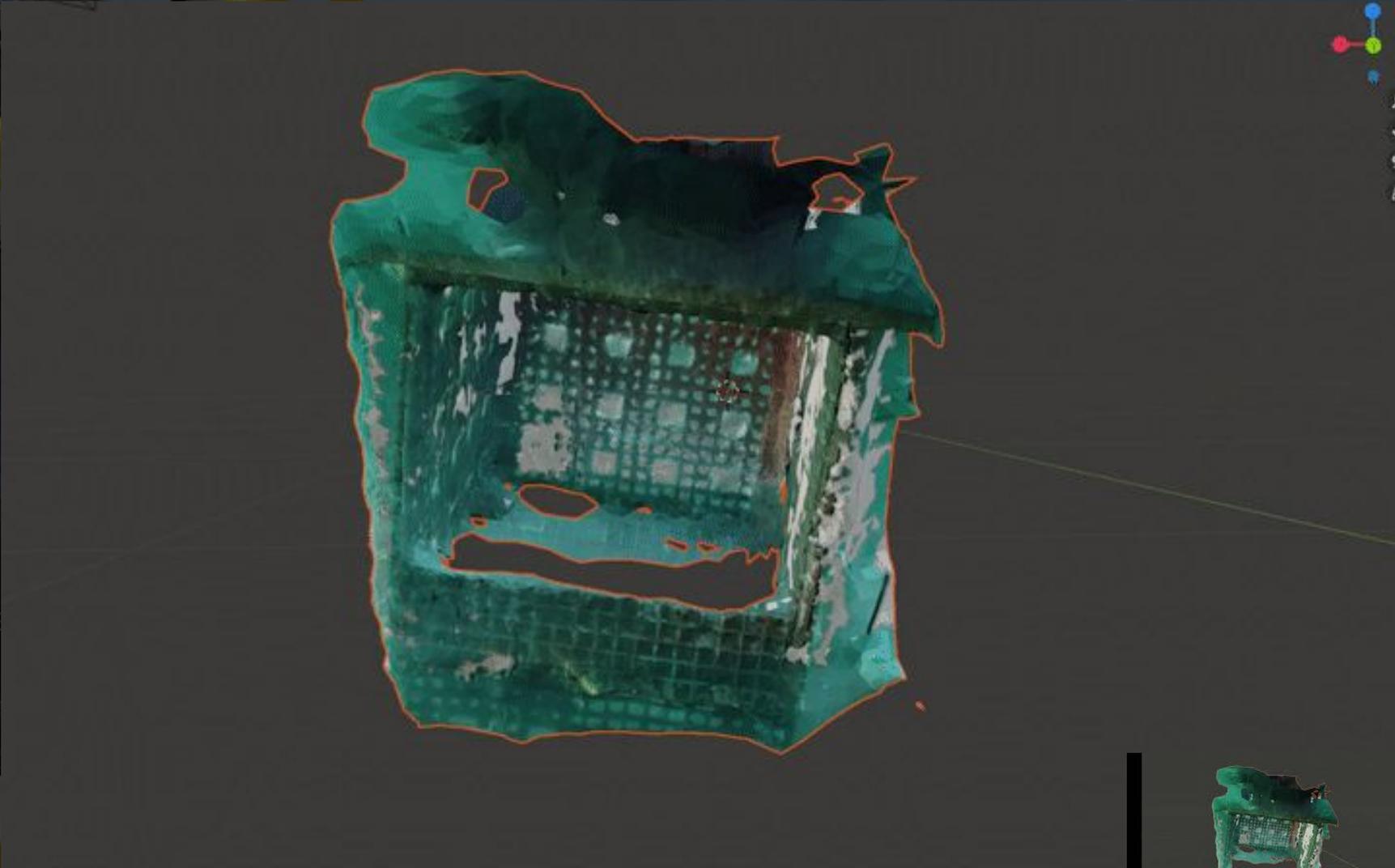
MESHROOM
Open Source Photogrammetry Software



Photogrammetry 



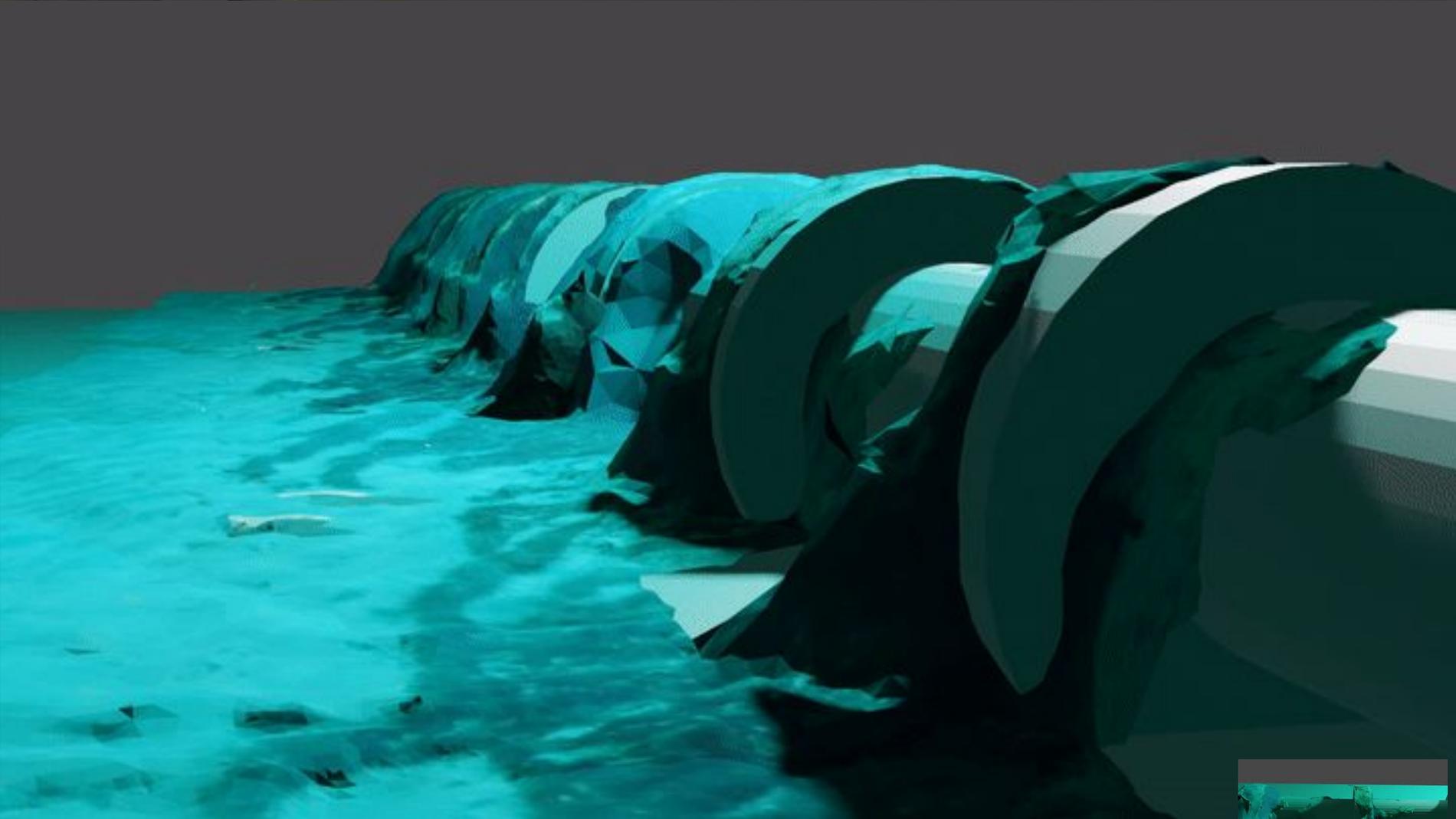
Photogrammetry 



Photogrammetry 



Photogrammetry 



(Click on the image to watch the video)





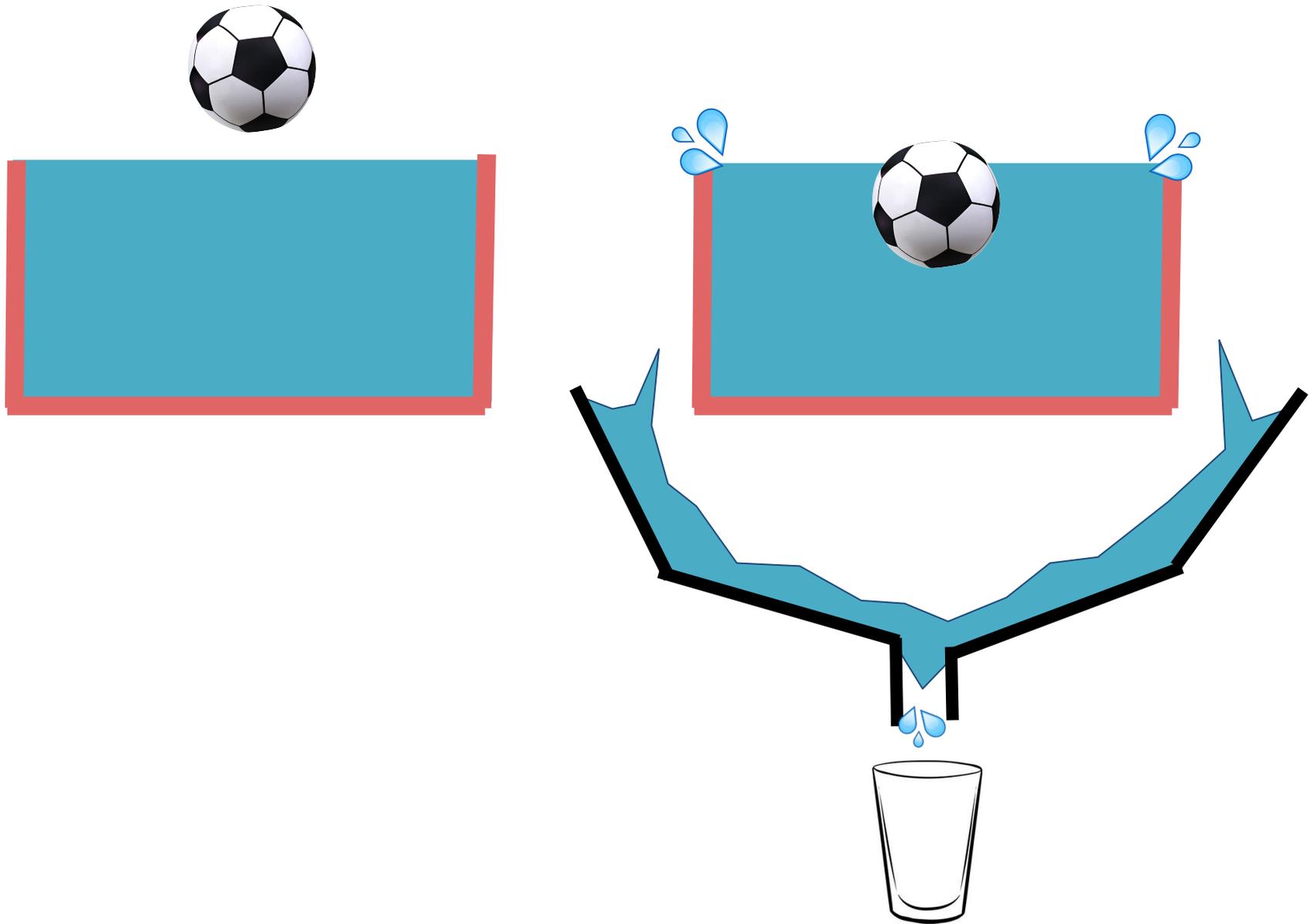
Any object, totally or partially immersed in a fluid or liquid, is buoyed up by a force equal to the weight of the fluid displaced by the object.



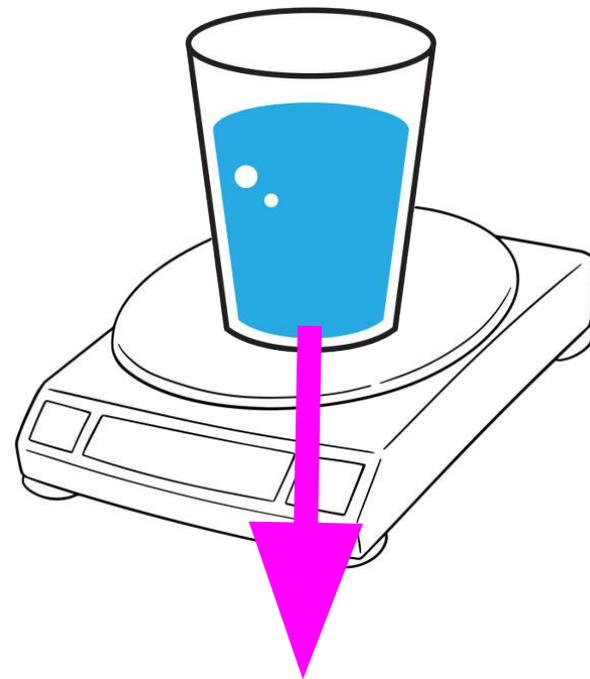
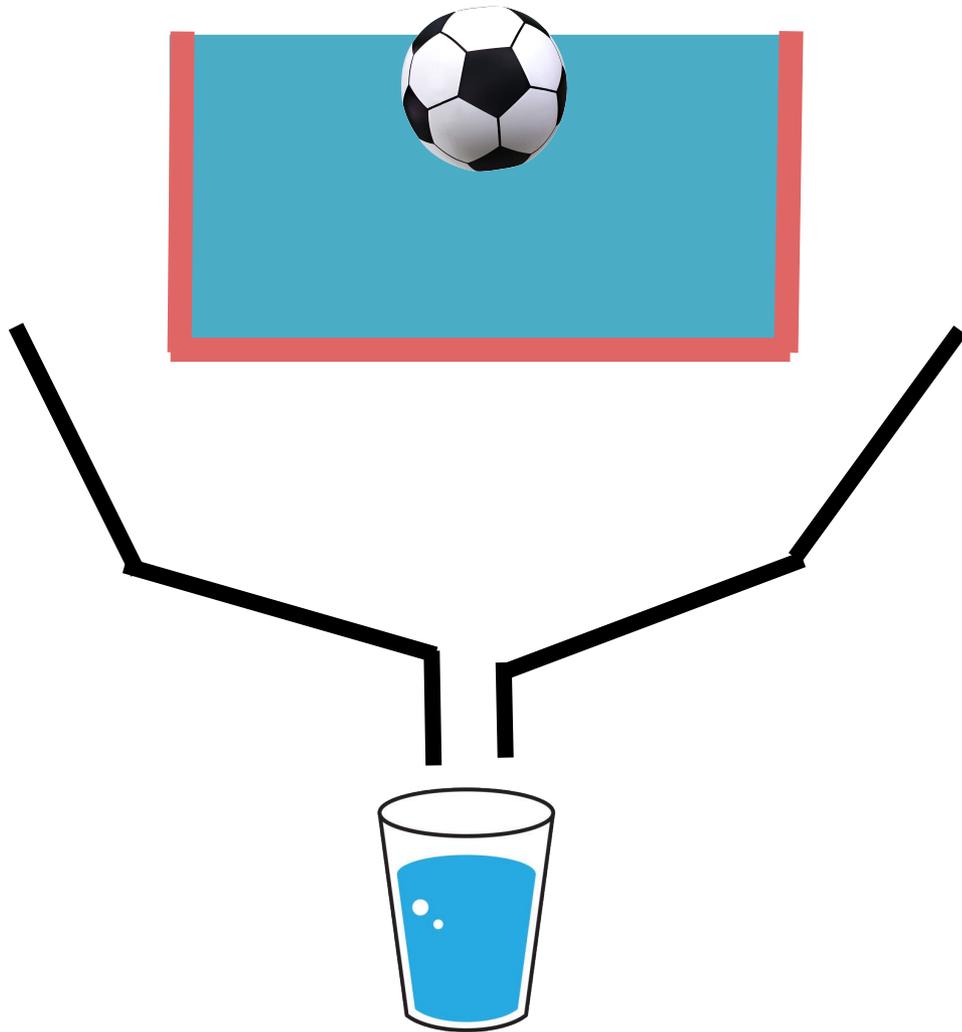
Todo cuerpo sumergido en un líquido experimenta una fuerza hacia arriba equivalente al peso del volumen desalojado



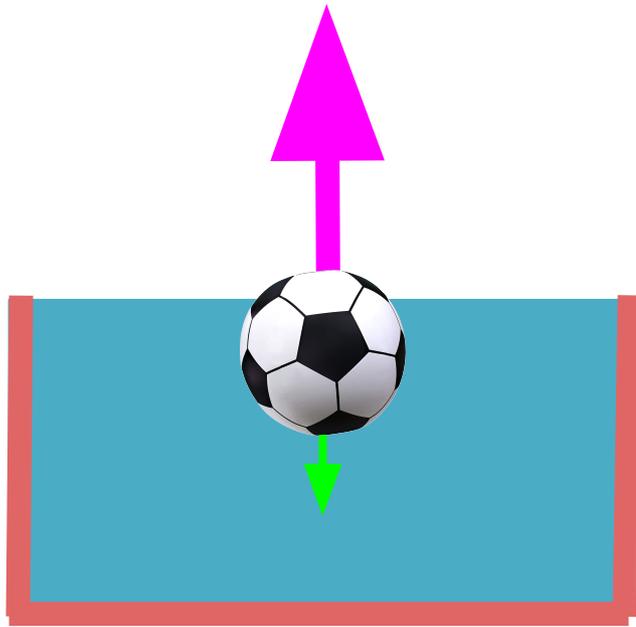
Archimedes Principle



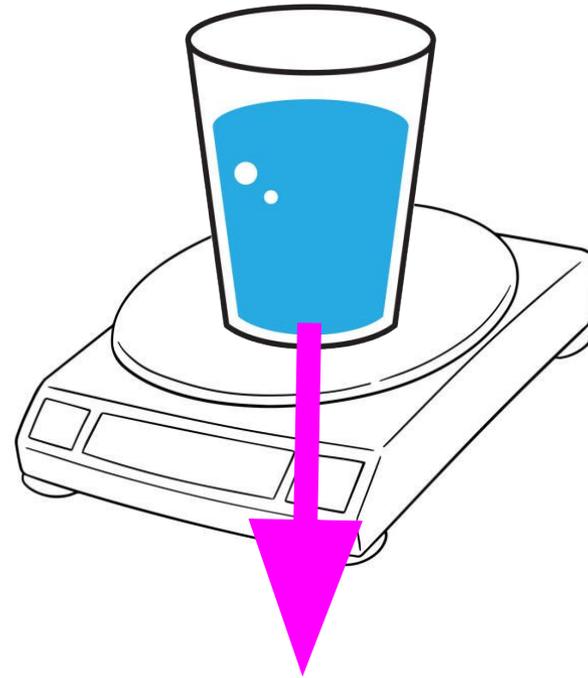
Archimedes Principle



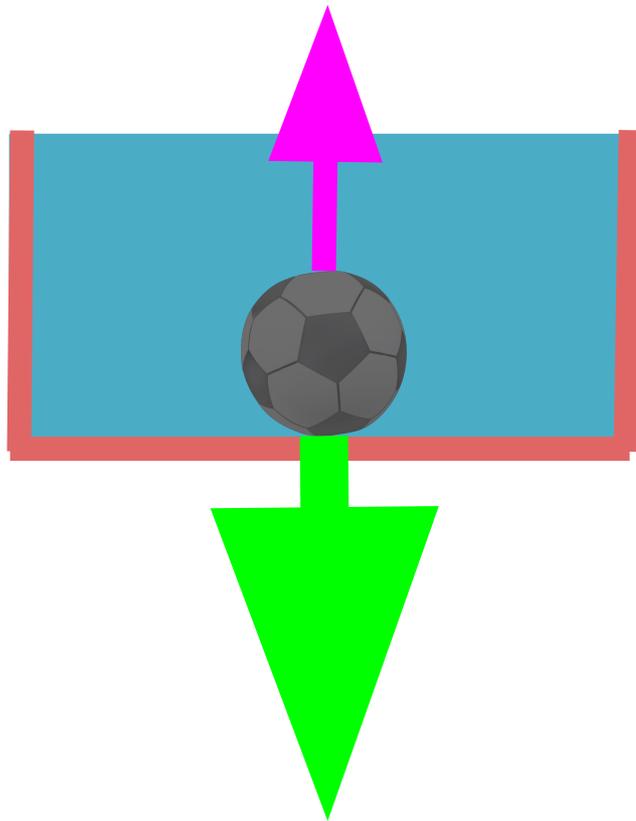
Archimedes Principle



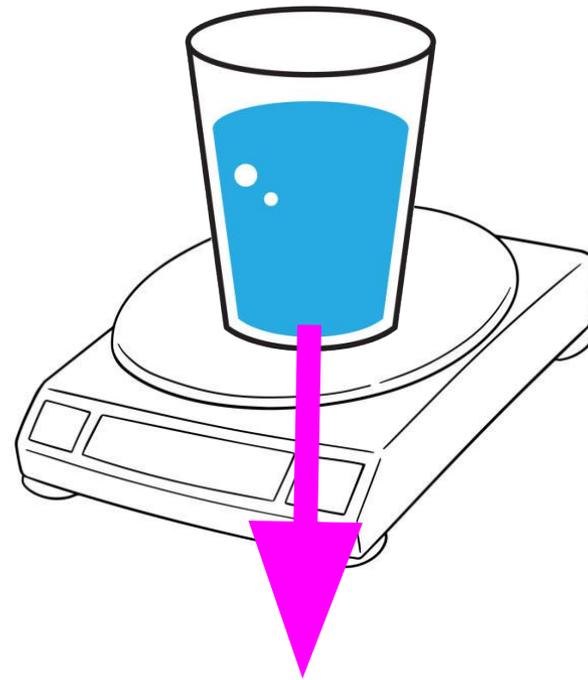
=



Archimedes Principle



=





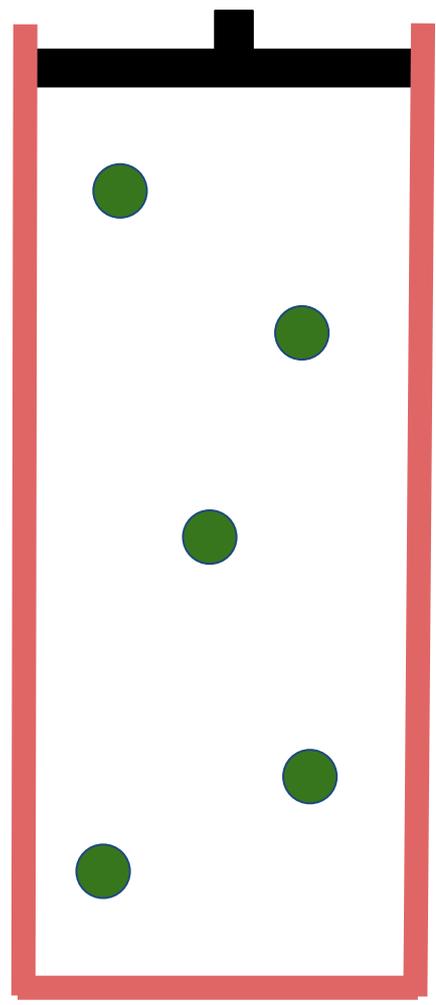
At constant temperature (and low pressure) the volume of a gas mass is inversely proportional to its pressure



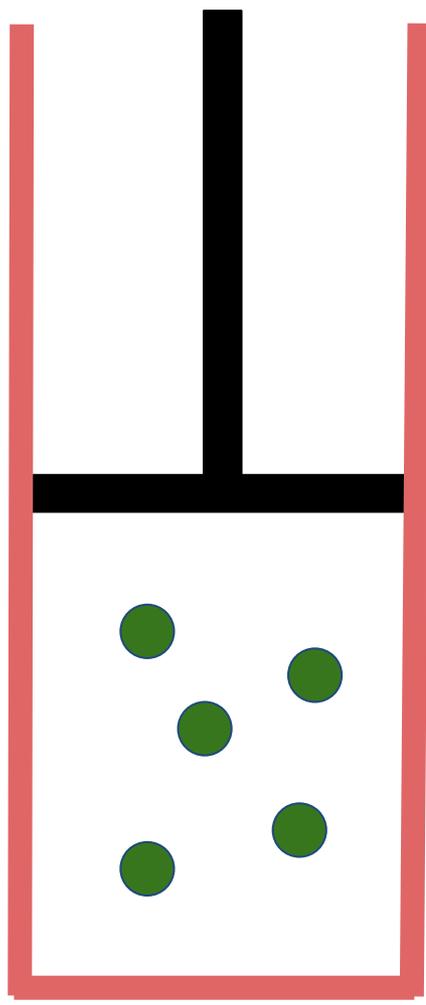
El volumen ocupado por un gas, a temperatura constante, es inversamente proporcional a su presión



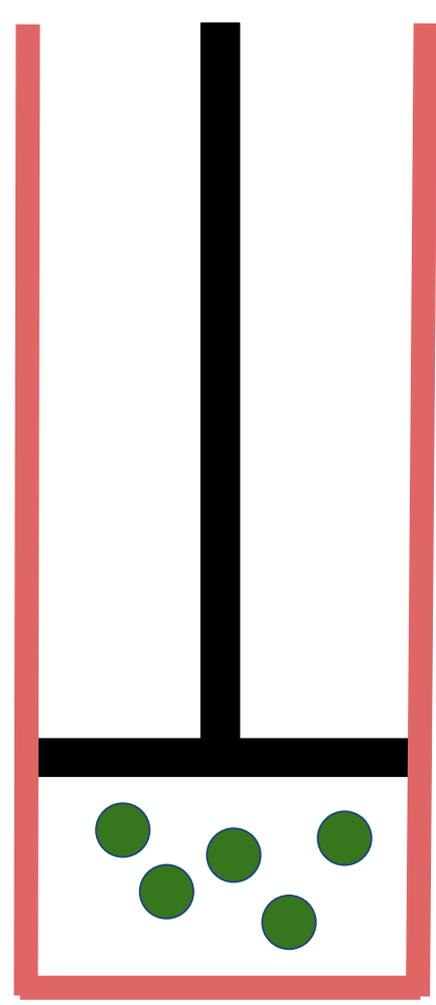
Boyle-Mariotte law



V=60 liters
P=0.5 atm



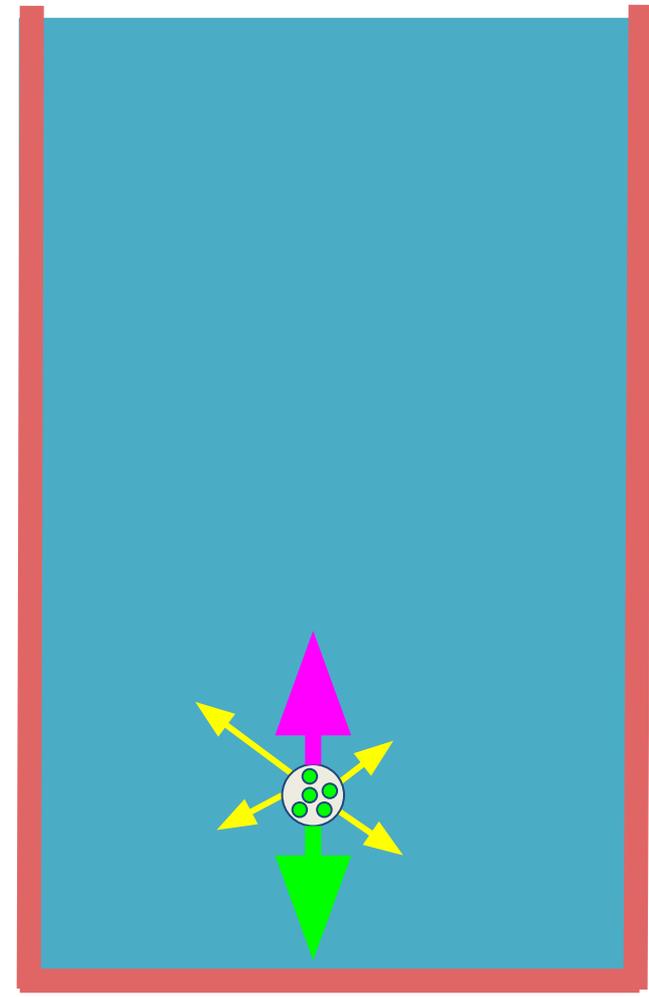
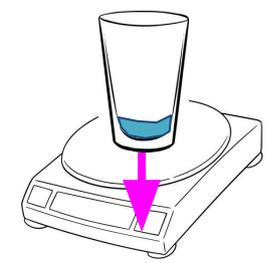
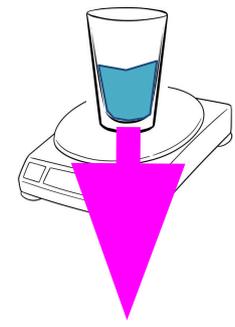
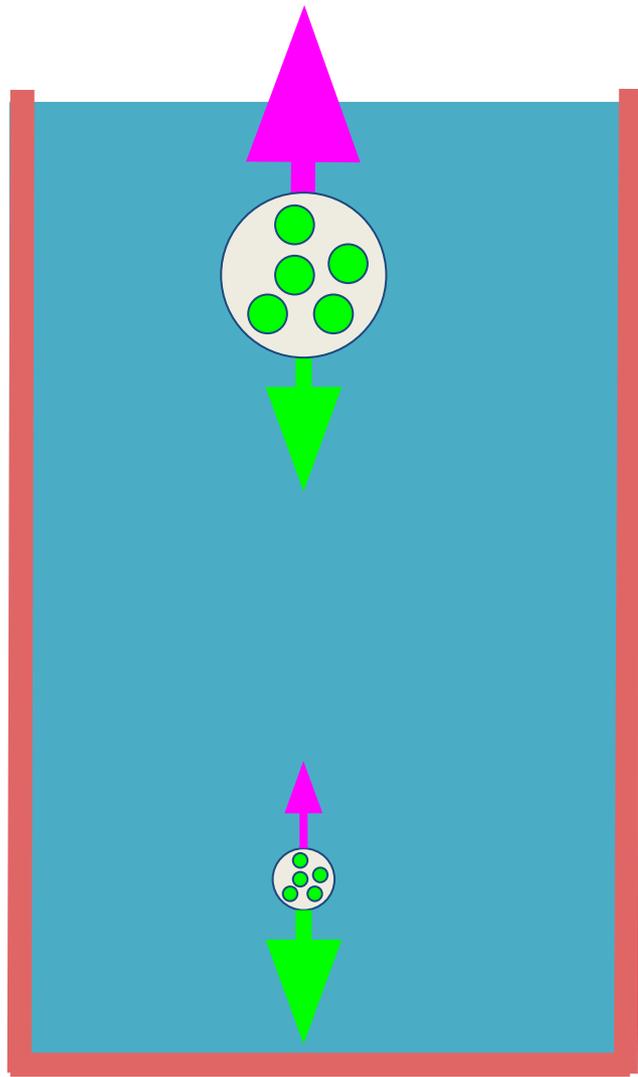
V = 30 liters
P = 1 atm



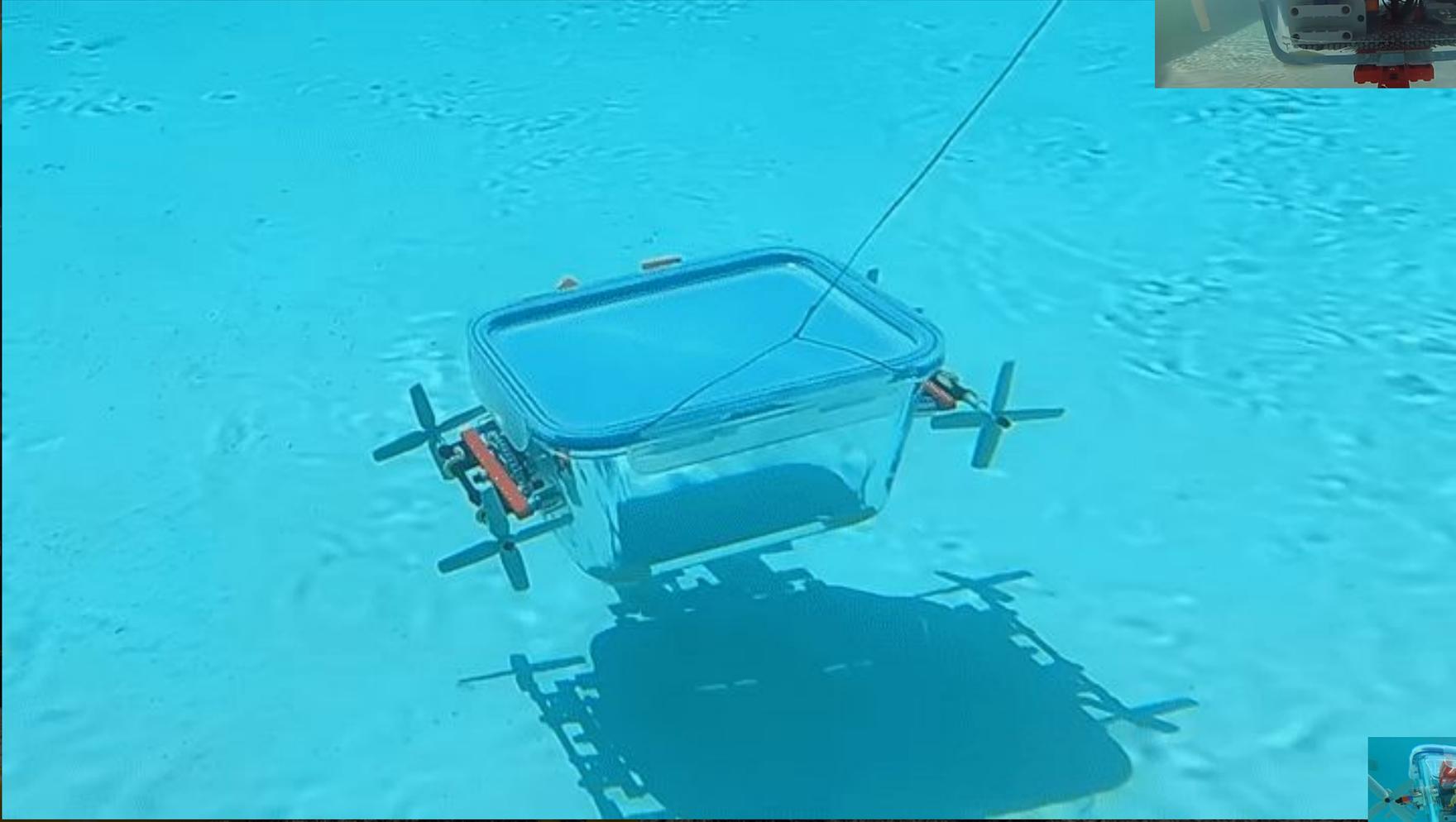
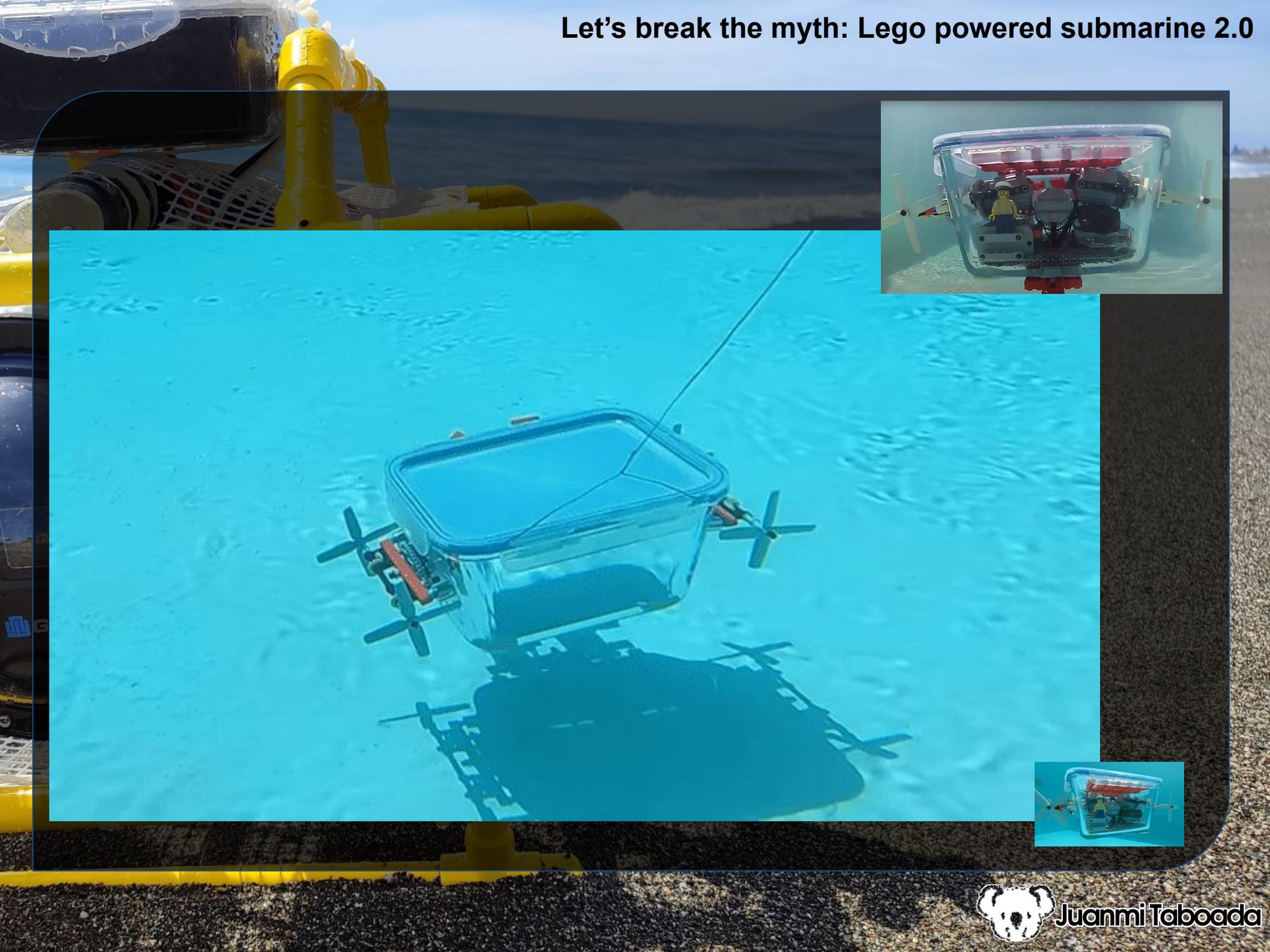
V = 15 liters
P = 2 atm



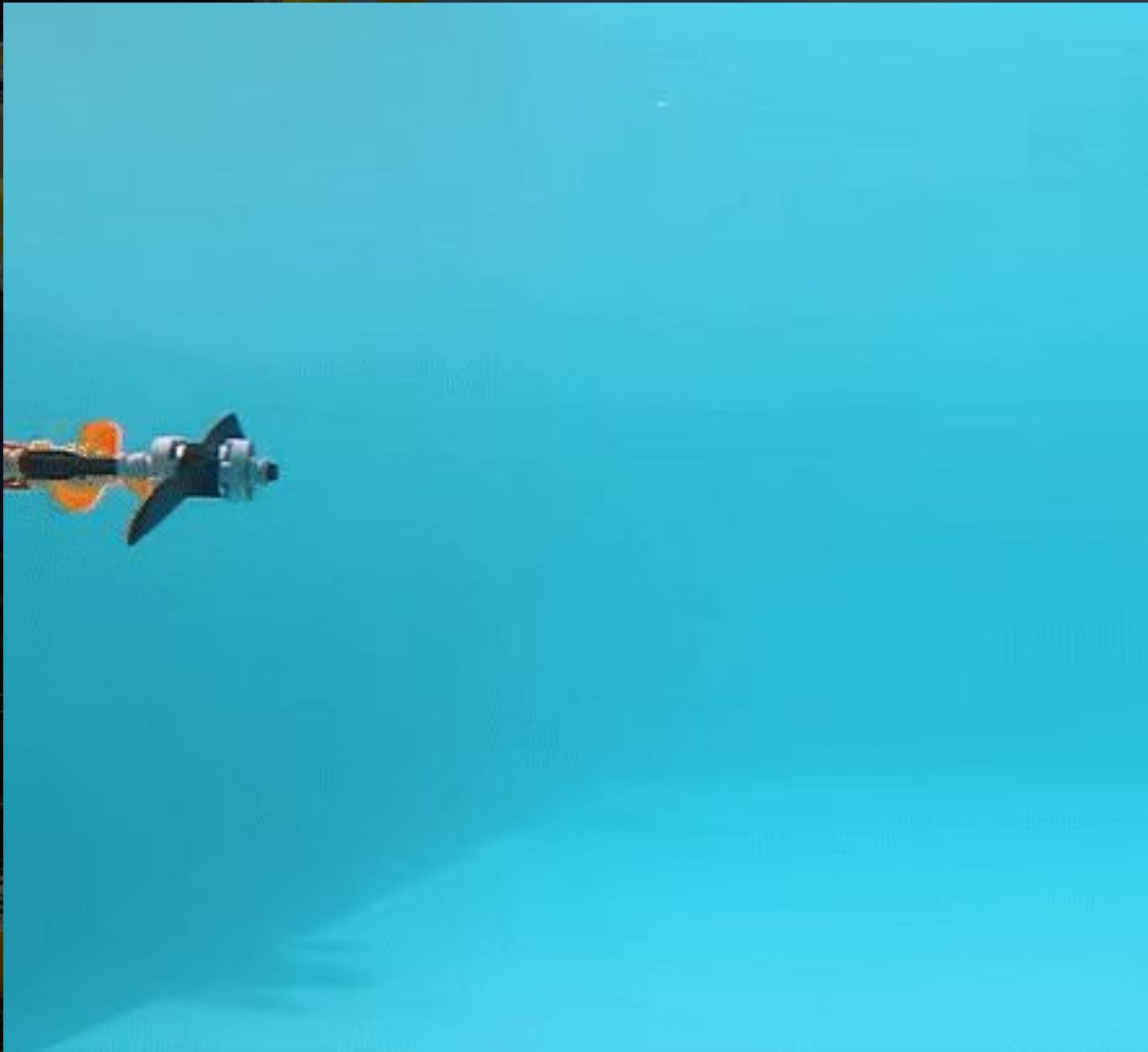
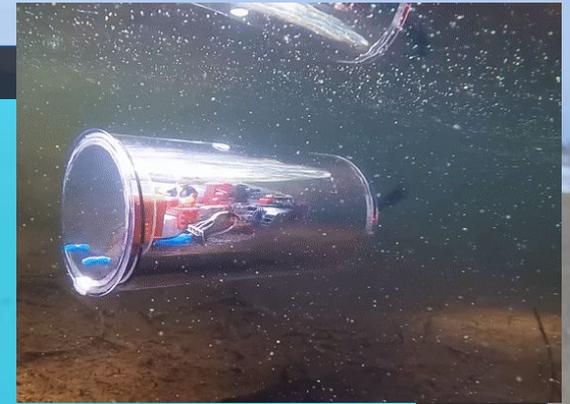
All together: Archimedes & Boyle-Mariotte



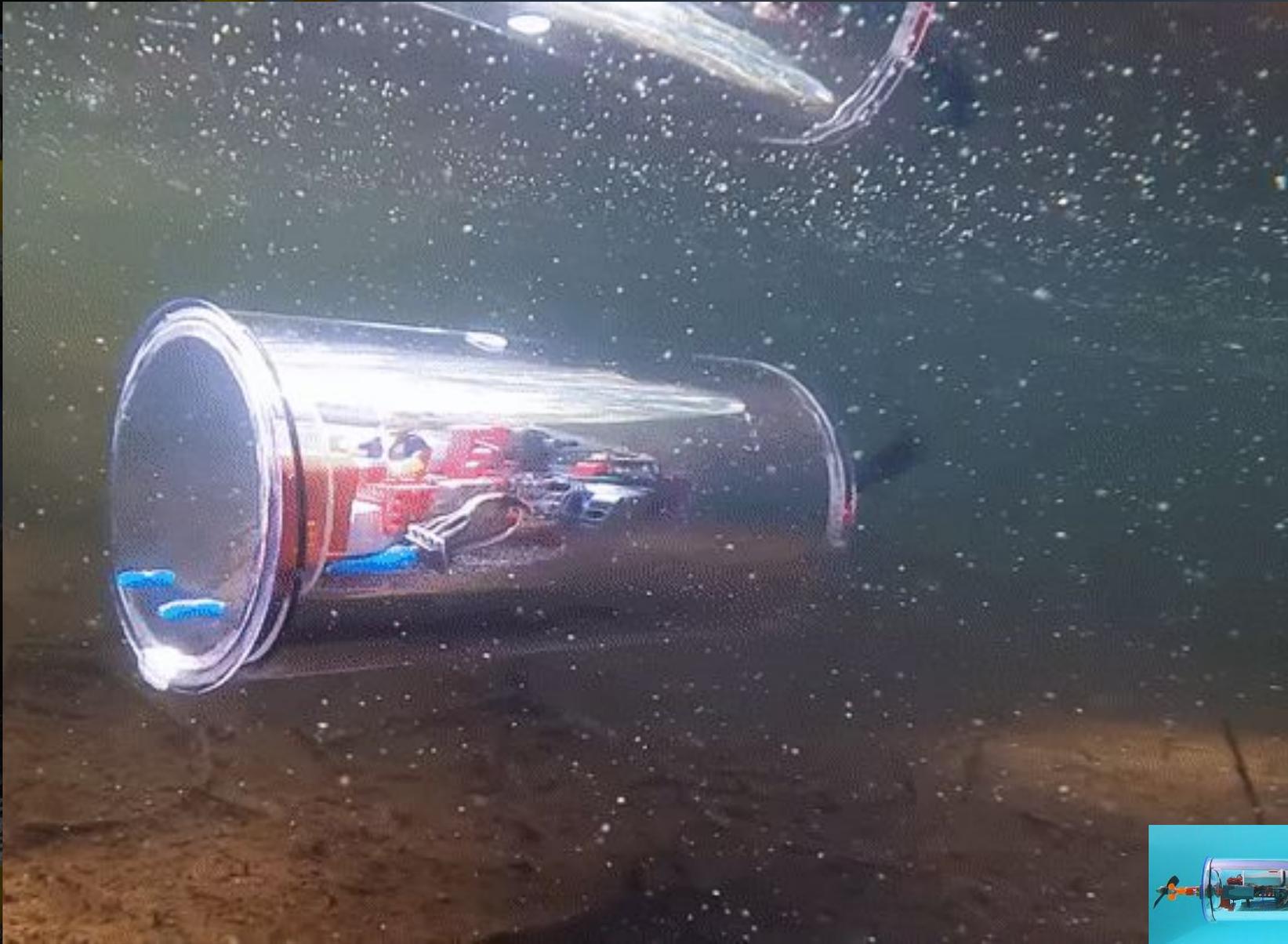
Let's break the myth: Lego powered submarine 2.0



Let's break the myth: Lego powered submarine 4.0



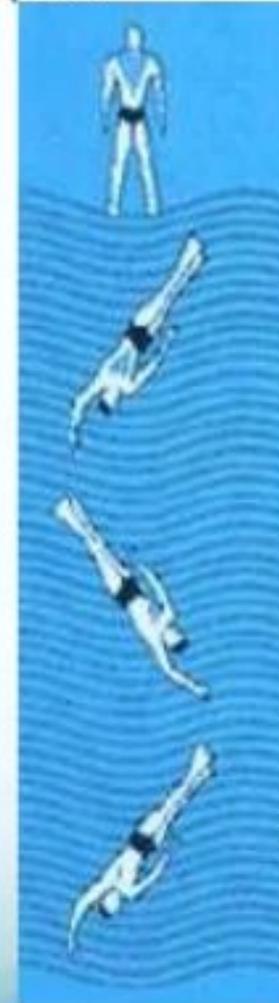
Let's break the myth: Lego powered submarine 4.0



& finally the numbers under the water

Boyles law (Volume and Pressure Changes) at Depth

Depth	Pressure	Relative Volume	Volume
Sea level	1 ATA	1 or 100%	20 l 
10 M	2 ATA	1/2 or 50%	10 l  ✓
20 M	3 ATA	1/3 or 33 %	6.7 l 
30 M	4 ATA	1/4 or 25 %	5 l  ✓
40 M	5 ATA	1/5 or 20%	4 l 
90 M	10 ATA	1/10 or 10%	2 l 



NB: Change in volume with pressure is the greatest nearer the surface



We are all set!



Fully digital control & telemetry
Built on Microcontrollers
Wireless communication
(wireless control & wireless video)

Satellite
GPS / GPRS

GPS
GPRS
Alioli Buoy

Base
Station 1
Boat
GPRS

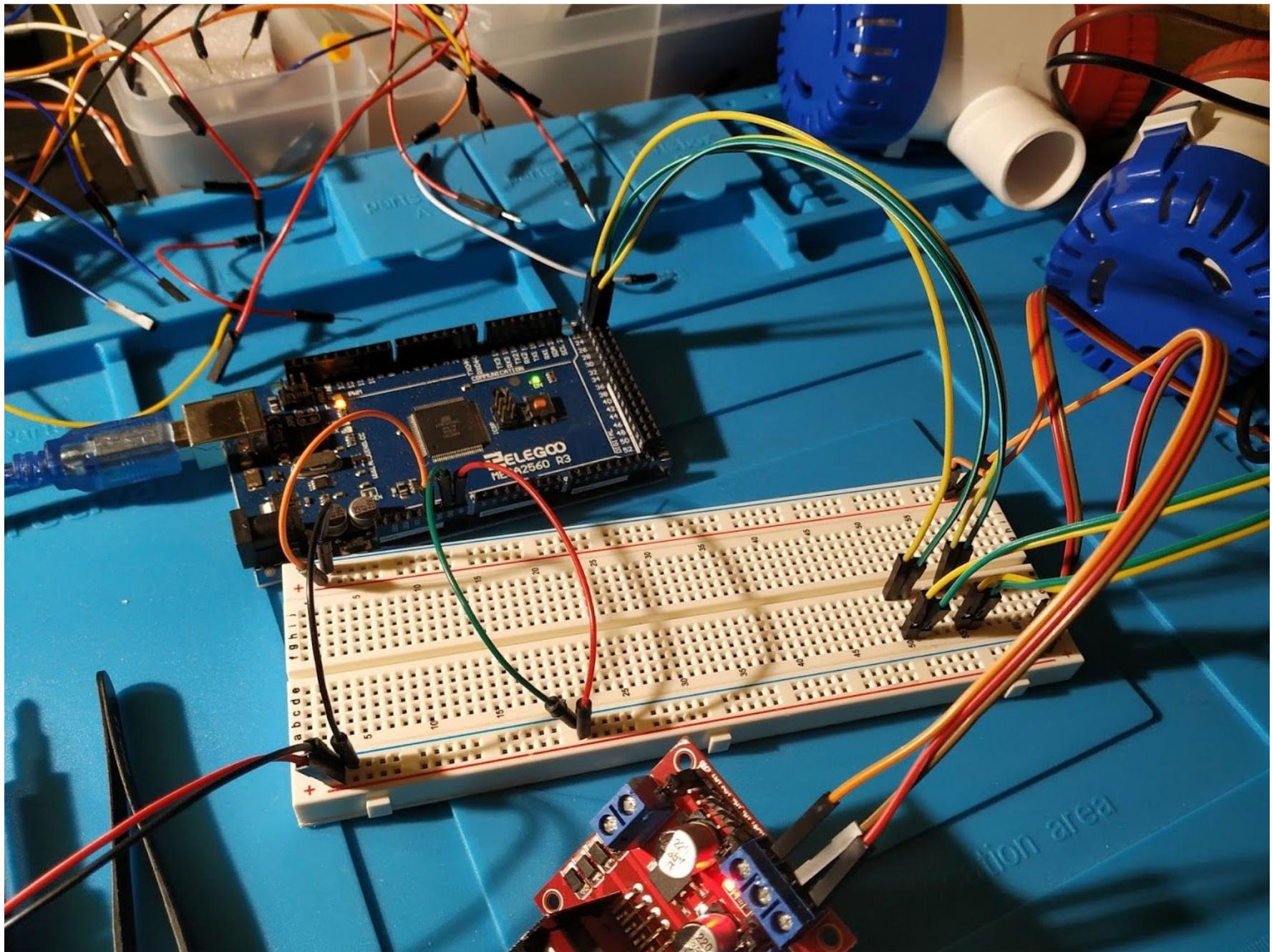
Base
Station 2
GPRS

Alioli ROV

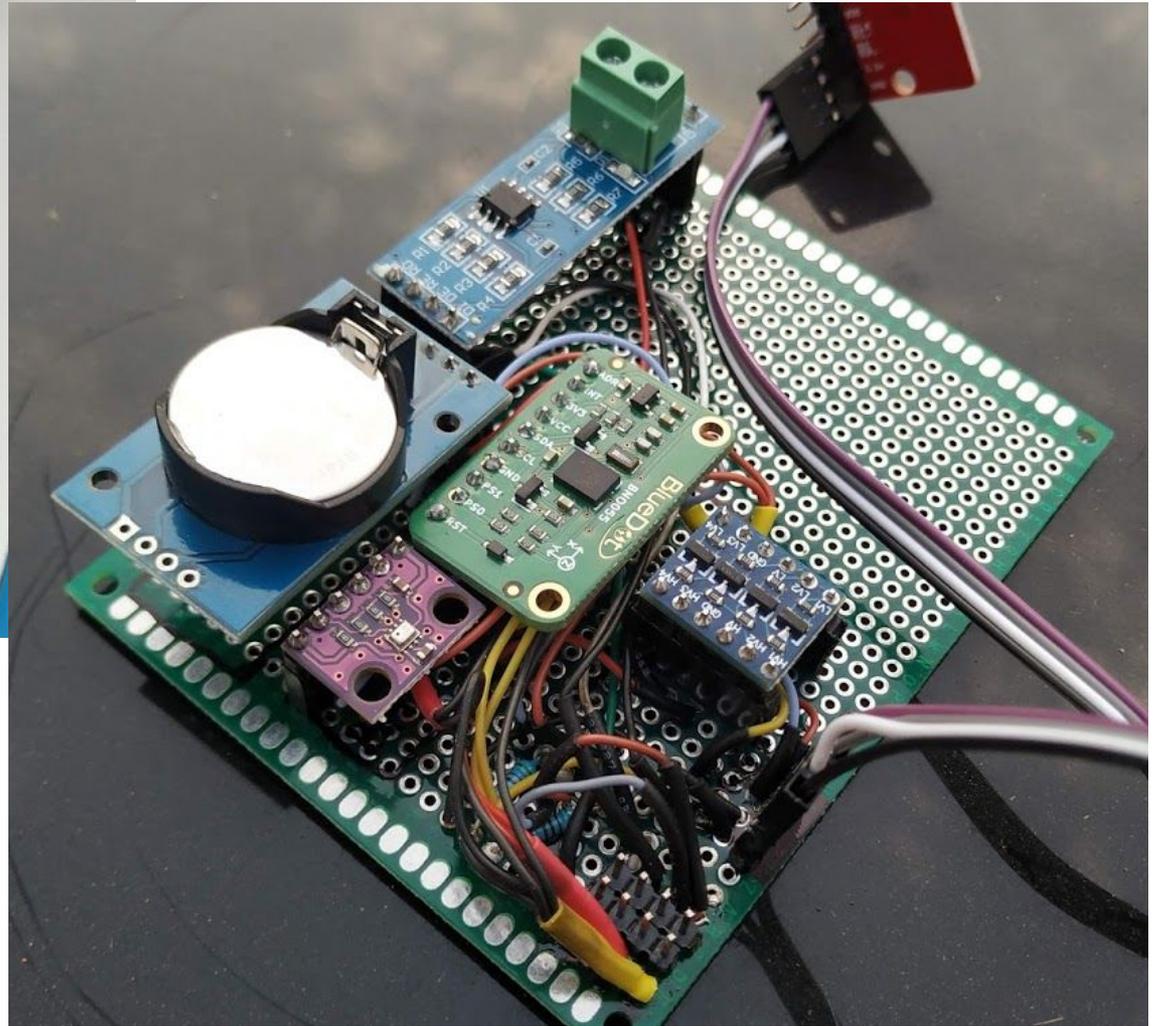
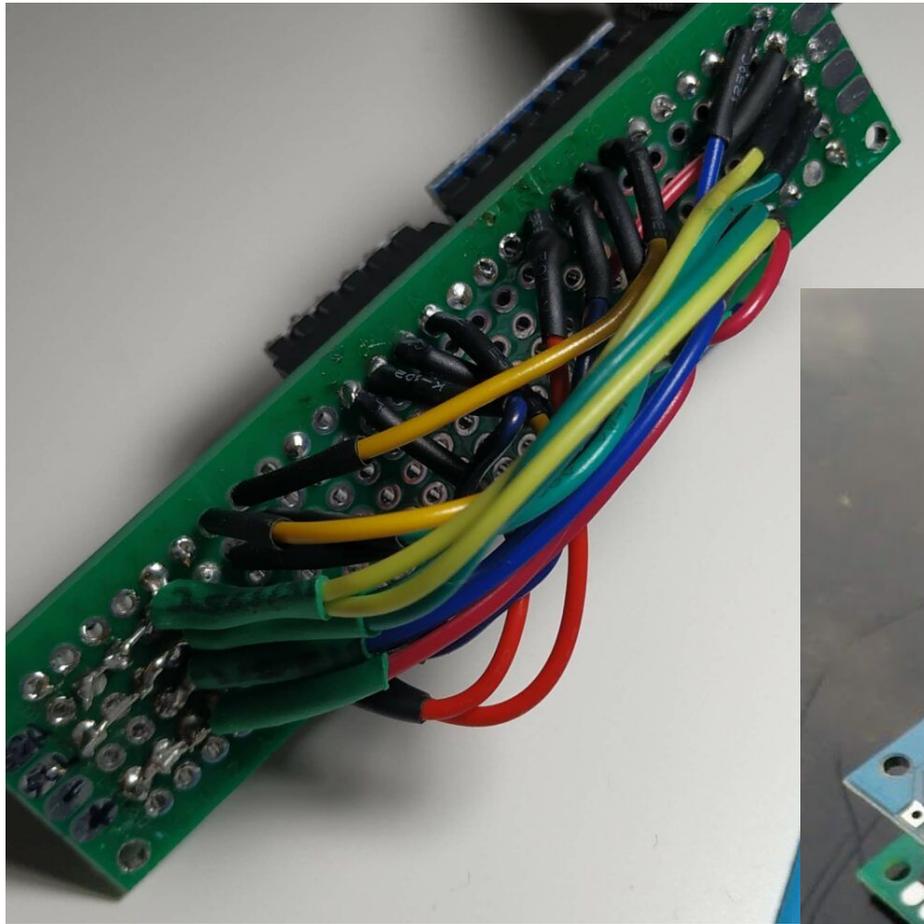




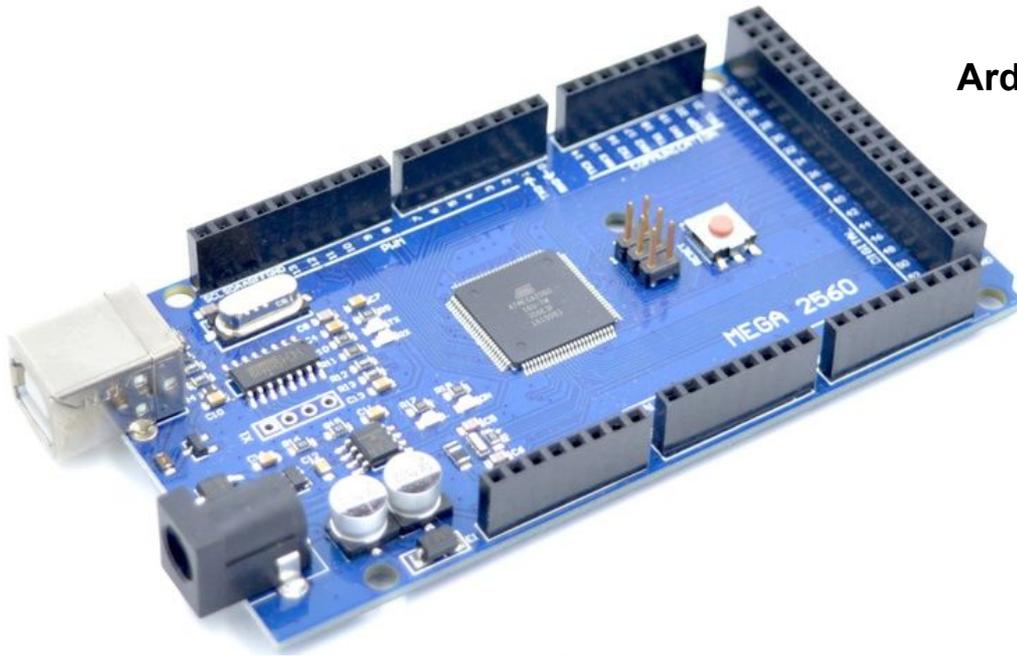
Low Cost Hardware: my first Arduino Kit



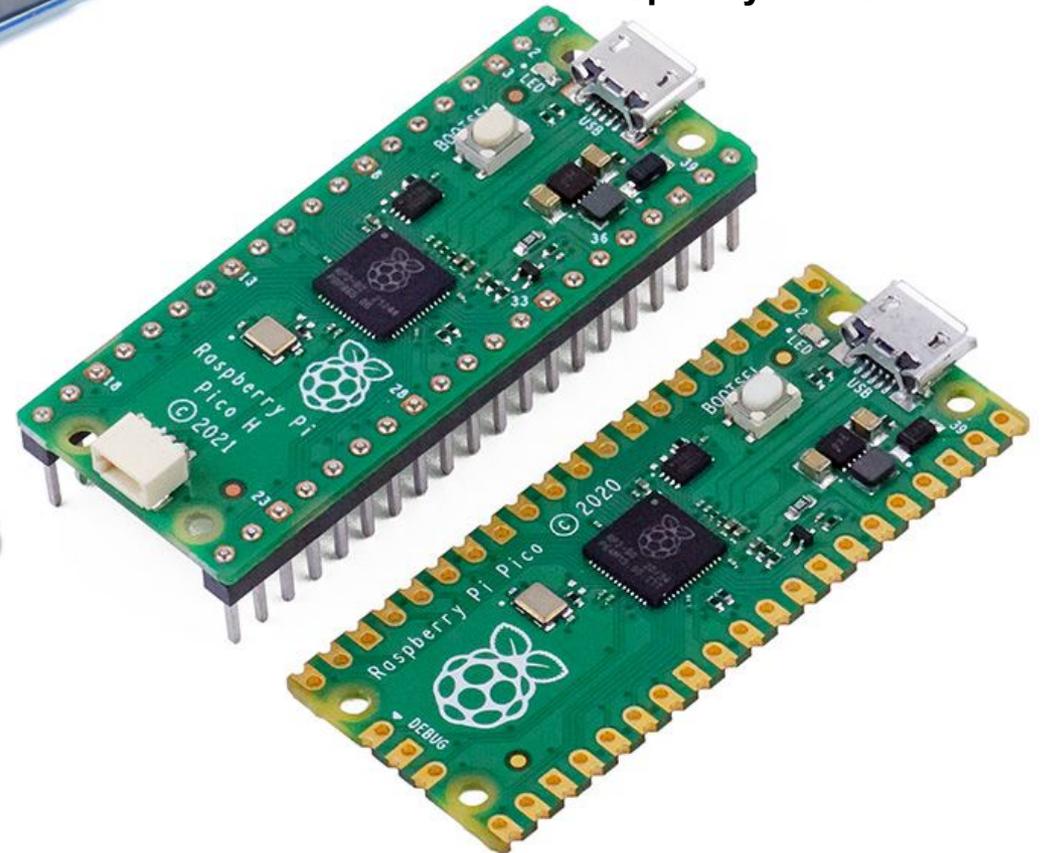
Low Cost Hardware: soldering technique



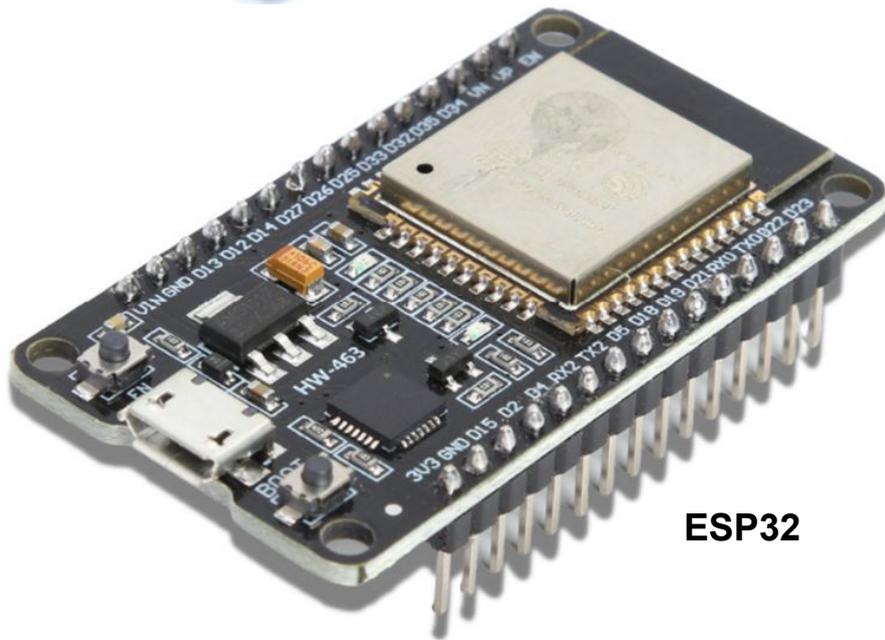
Arduino Mega 2560



Raspberry Pi Pico

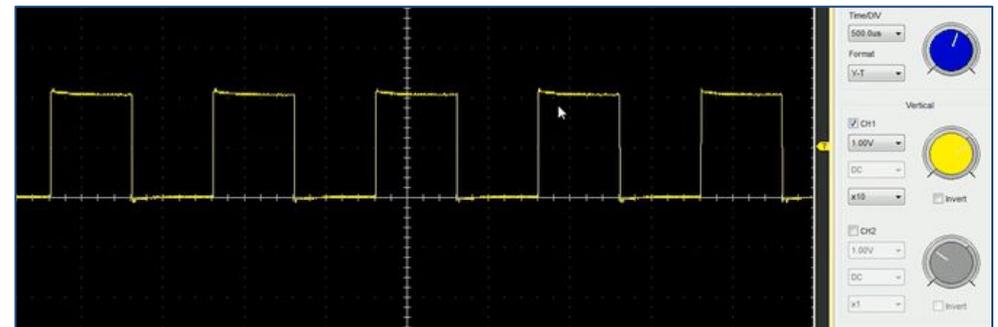
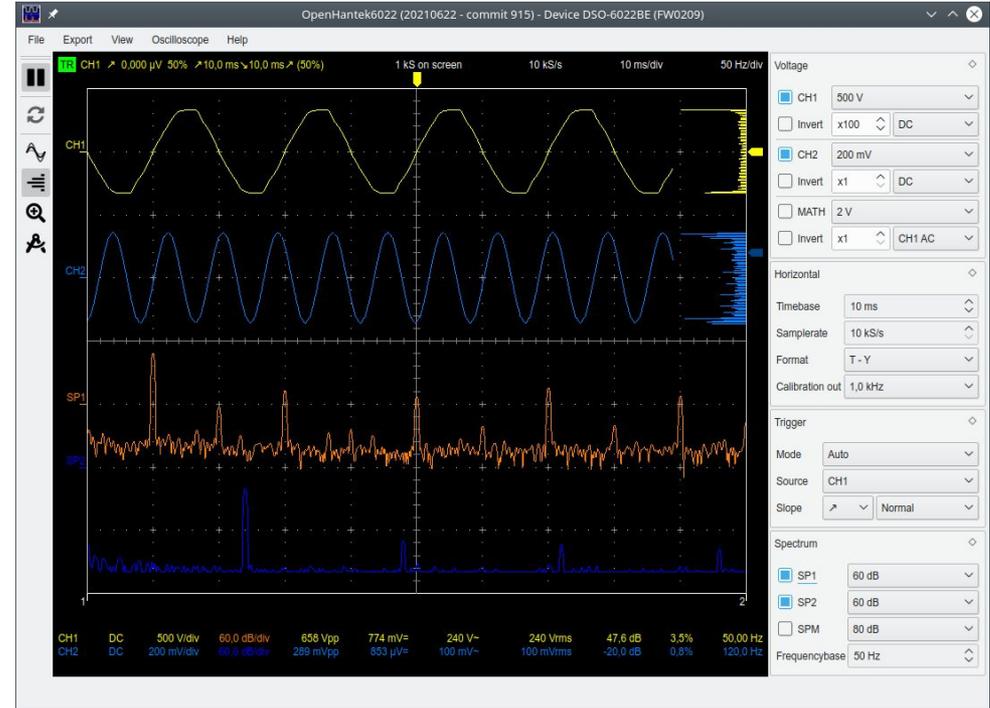


ESP32

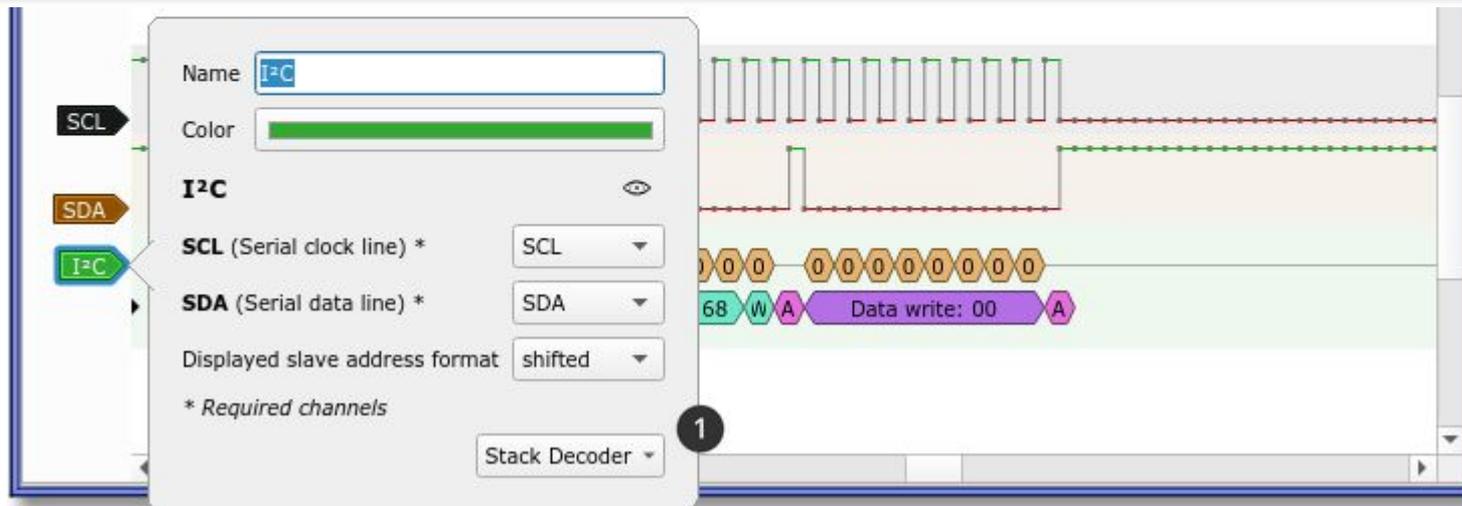
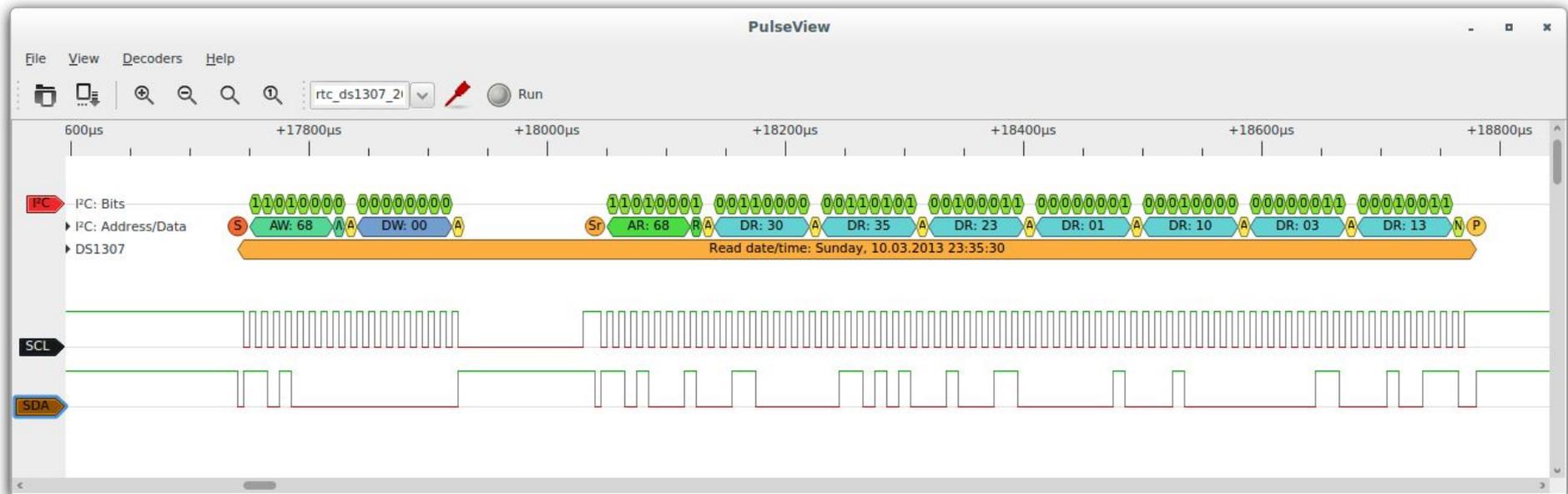


Software requires a Debugger, hardware too...this is **OpenHantek!**

It made
my days!

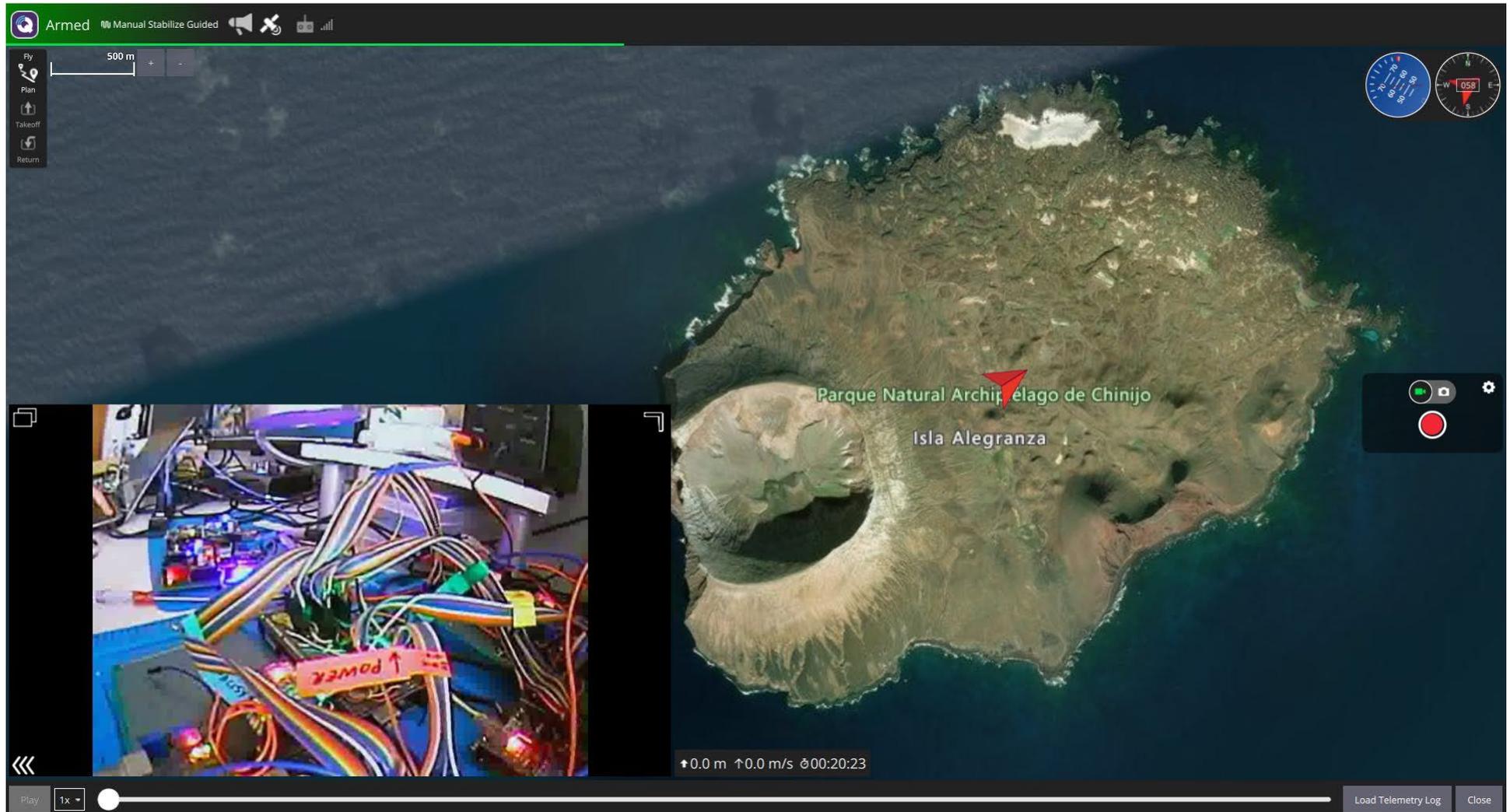


Software requires a Debugger, hardware too...this is **Pulseview**!



<p>06-12-2022 15:05:37 (1670335537)</p> <p>2.140.120.239 : 3814 (2.140.120.239)</p> <p>Buoy v1.1 (20220329100623CEST)</p> <p>11 seconds ago</p> <p><u>Online for:</u> 49 minutes</p>	Buoy Millis:	3013929	2963649	2913518	2863399	2813217	2763058	2712886
	Buoy Latitude:							
	Buoy Longitude:							
	Buoy Main Amperage:	1083.3	988.9	1180.3	954.2	1101	1184.6	1014.8
	Buoy Main Voltage:	11.6	11.7	11.8	11.7	11.7	11.8	11.7
	Buoy Temp Main Battery:	25.2	25.3	25.2	25.3	25.3	25.2	25.1
	Buoy Temp Sea Water:	15.6	15.6	15.8	15.8	15.8	15.5	15.6
	Rov Altitude:	21.5	20.8	19.2	16.4	14.1	10.9	12.3
	Rov Engines Amperage:	0	0	0	0	0	0	0
	Rov Engines Voltage:	8.6	8.6	8.6	8.6	8.6	8.6	8.6
	Rov Main Amperage:	183	192.3	188.5	189.3	182.8	190.3	183.9
	Rov Main Voltage:	11.8	11.8	11.8	11.8	11.8	11.8	11.8
	Rov Pressure:	-2.6	-2.5	-2.3	-2	-1.7	-1.3	-1.5
	Rov Ready:	1	1	1	1	1	1	1
	Rov Temp BMP:	23.8	23.9	24.1	24.2	24.3	24.4	24.5
	Rov Temp Engines Battery:	19.1	19.2	19.5	19.9	20.2	20.9	21.1
	Rov Temp Gyro:	28	28	28	28	28	28	28
Rov Temp Main Battery:	23.9	23.9	23.9	23.9	23.9	24	24	
Rov Temp Sea Water:	15.6	15.7	15.7	15.6	15.8	15.8	17.1	





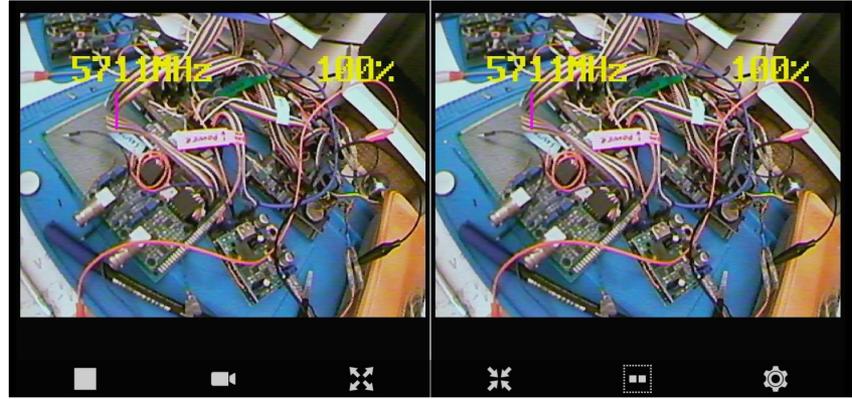
 **QGroundControl**

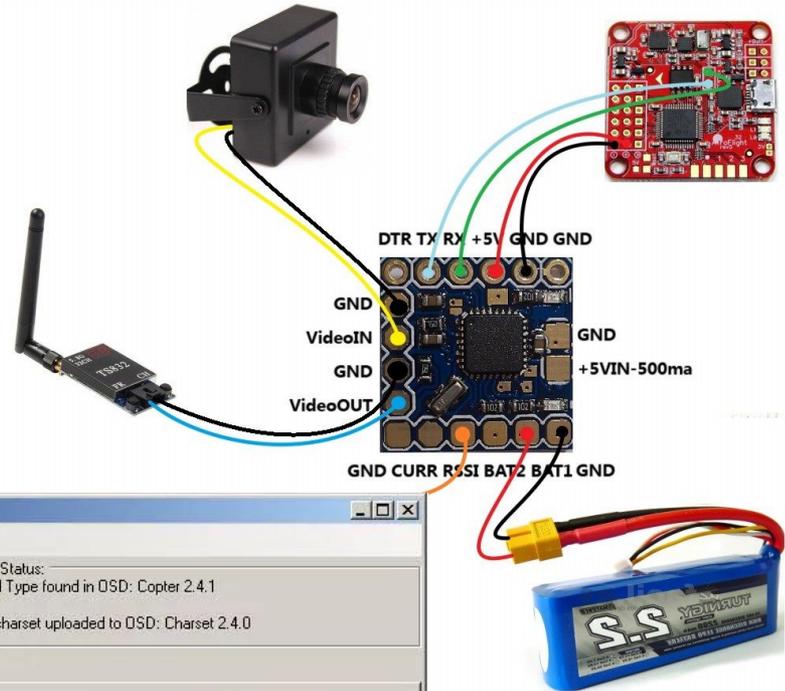
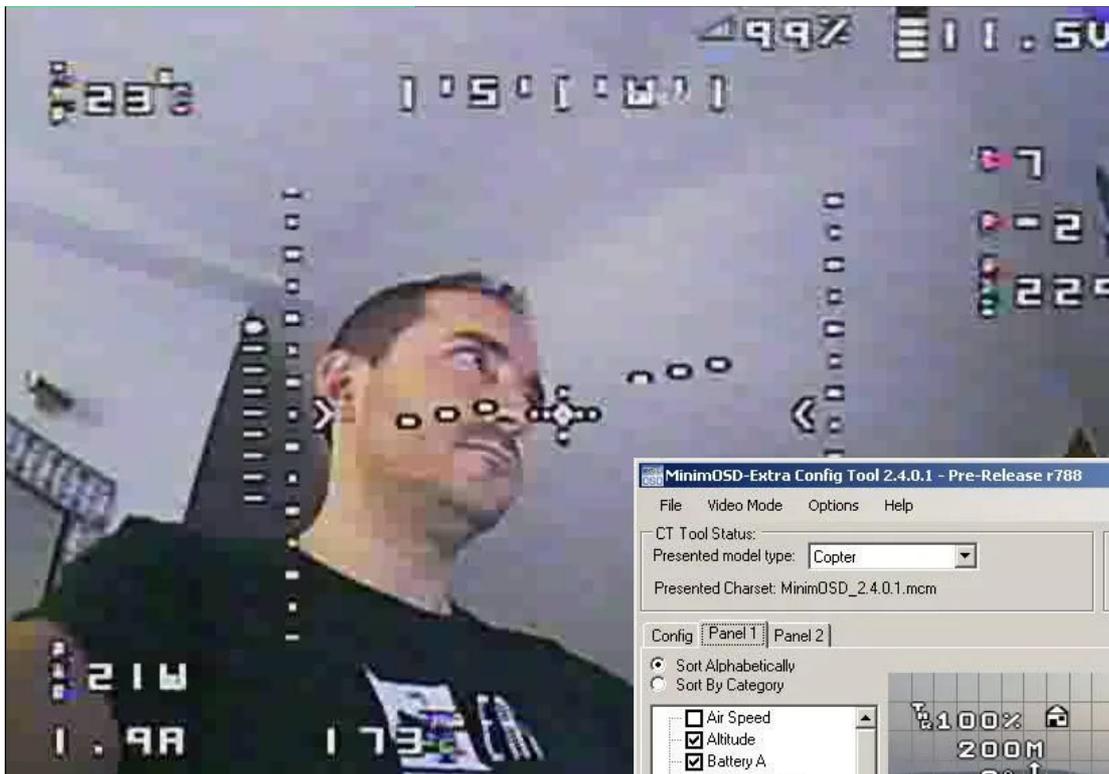


5.8Ghz



FPV
skydroid





MinimOSD-Extra Config Tool 2.4.0.1 - Pre-Release r788

File Video Mode Options Help

CT Tool Status:
Presented model type: **Copter**
Presented Charset: MinimOSD_2.4.0.1.mcm

OSD Status:
Model Type found in OSD: Copter 2.4.1
Last charset uploaded to OSD: Charset 2.4.0

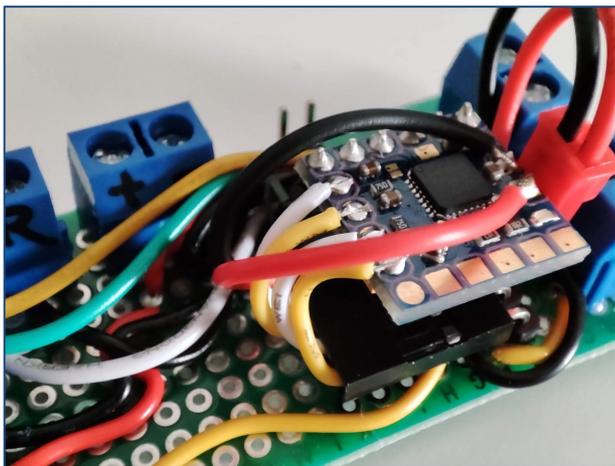
Config **Panel 1** Panel 2

Sort Alphabetically
 Sort By Category

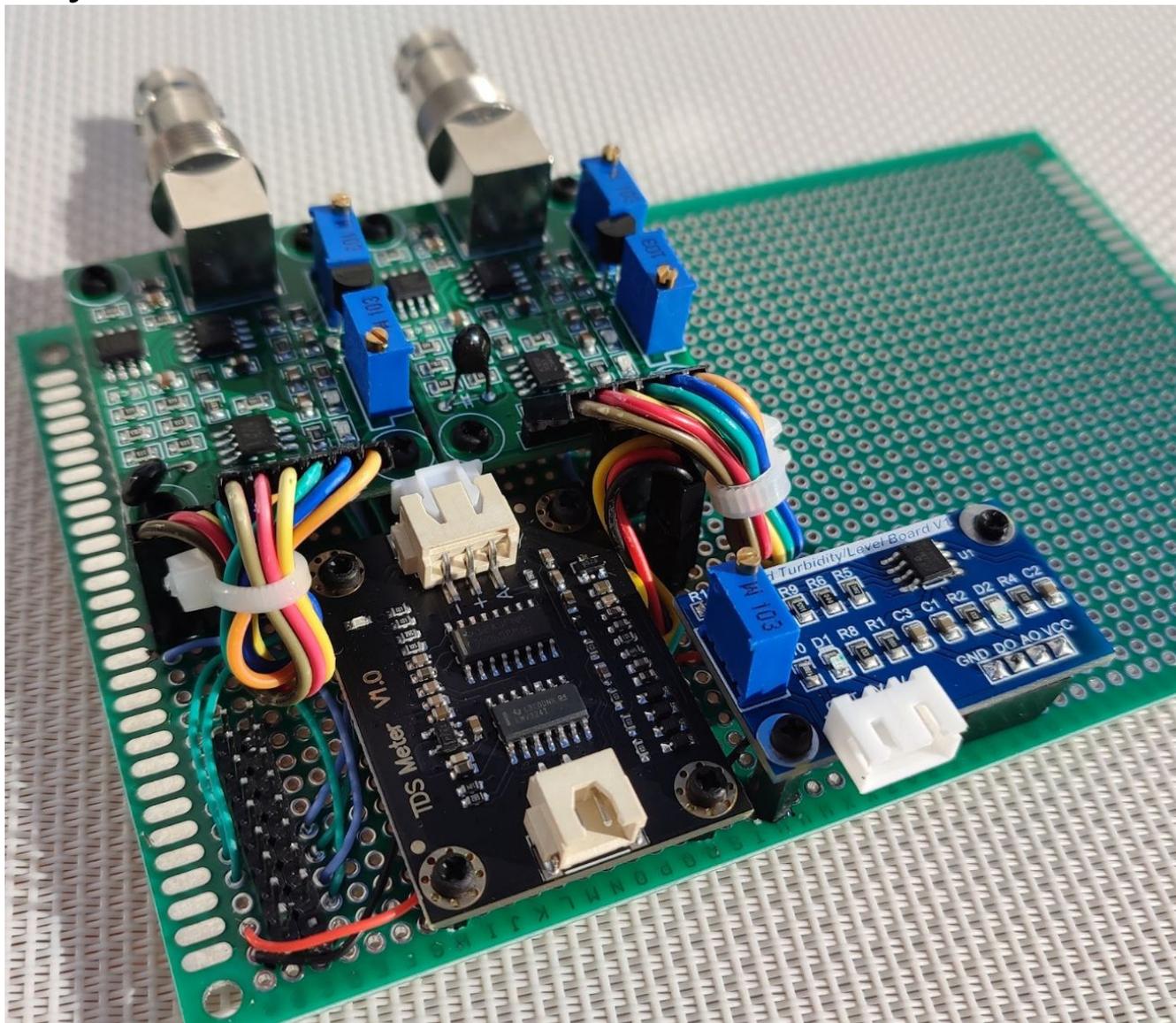
- Air Speed
- Altitude
- Battery A
- Battery Percent
- Call Sign
- Current
- Efficiency
- Flight Mode
- GPS Coord
- Heading
- Heading Rose
- Home Altitude
- Home Direction
- Home Distance
- Horizon

X:
Y:

Serial Port: **COM16** Read From OSD Save Current Tab to OSD



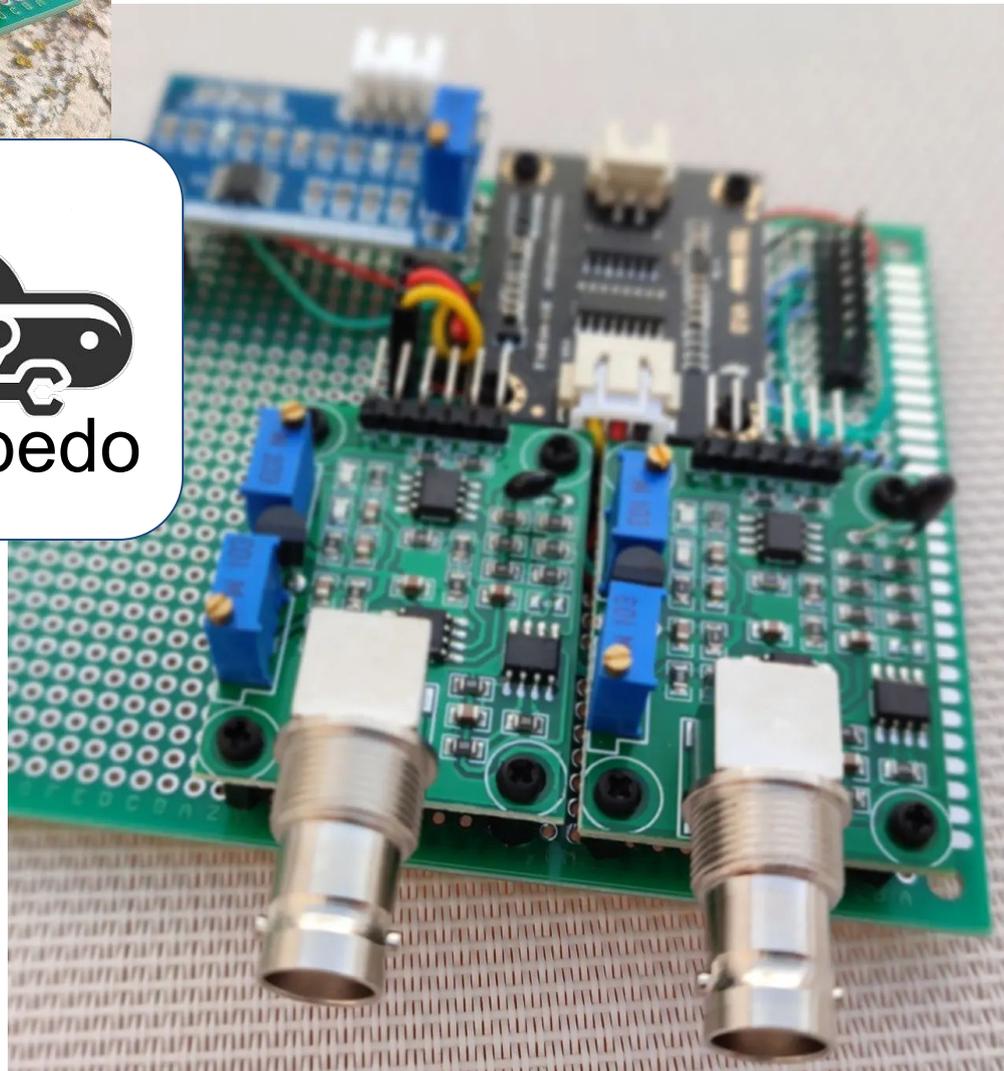
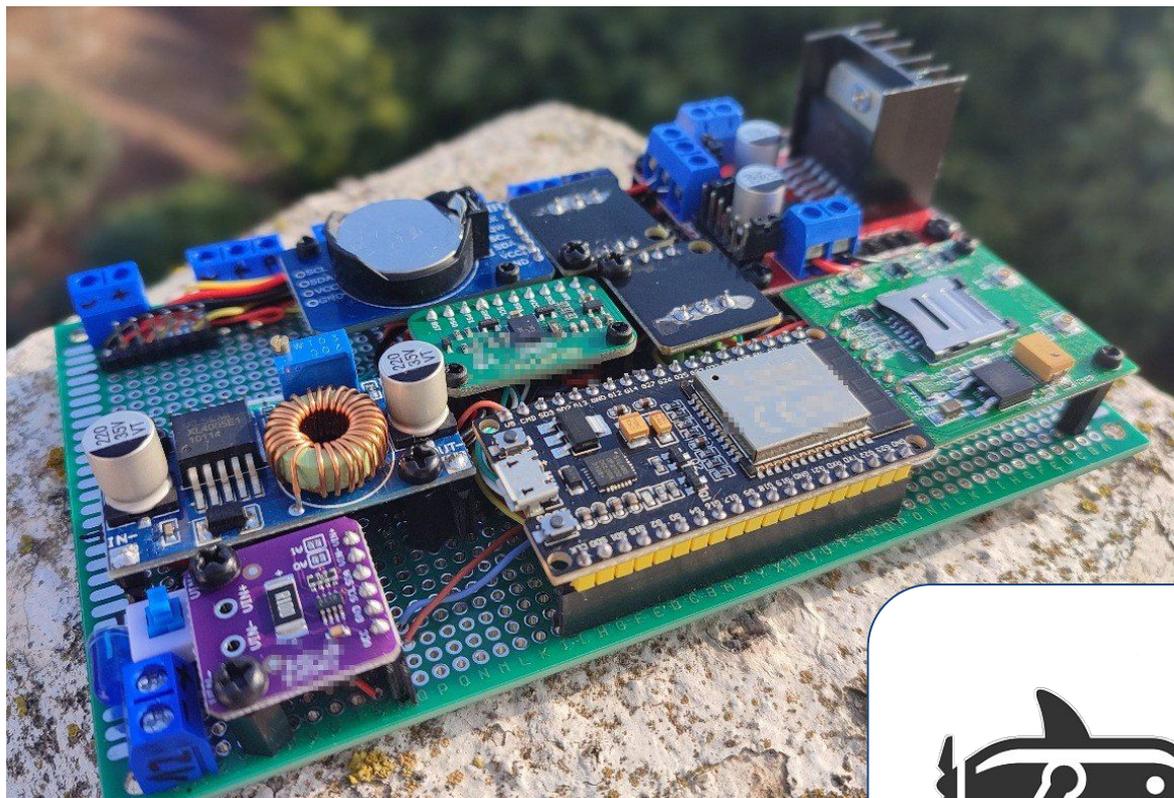
- Divide and conquer (Mavlink & Working Units)
- Water analytics board



- Torpedo (Micropython) - Fast and Furious!



What else?



- Underwater photography
- Body search
- Study and act on species invasions
- Archaeology
- Scuba diver companion
- Disabled people with underwater health conditions and diseases
- Game simulations (racing, wars and competitions)
- Cheap bathymetry



But...it's never enough!

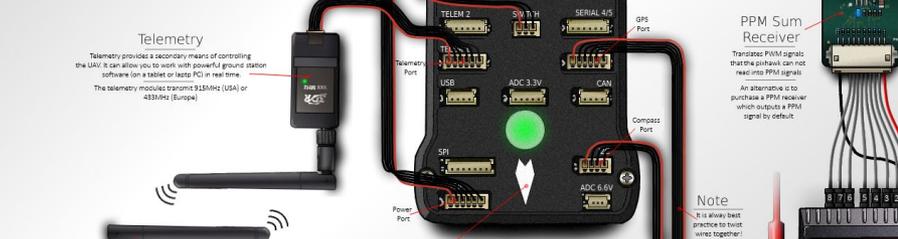
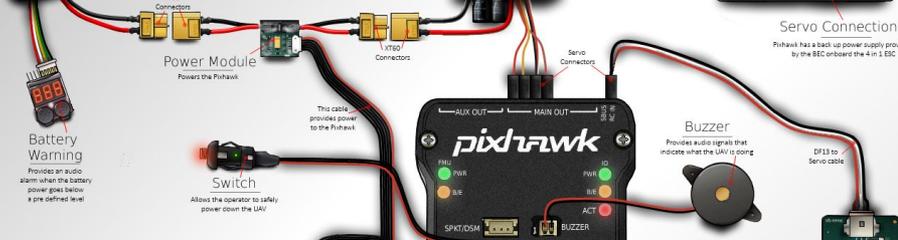


Lithium Ion Polymer Battery

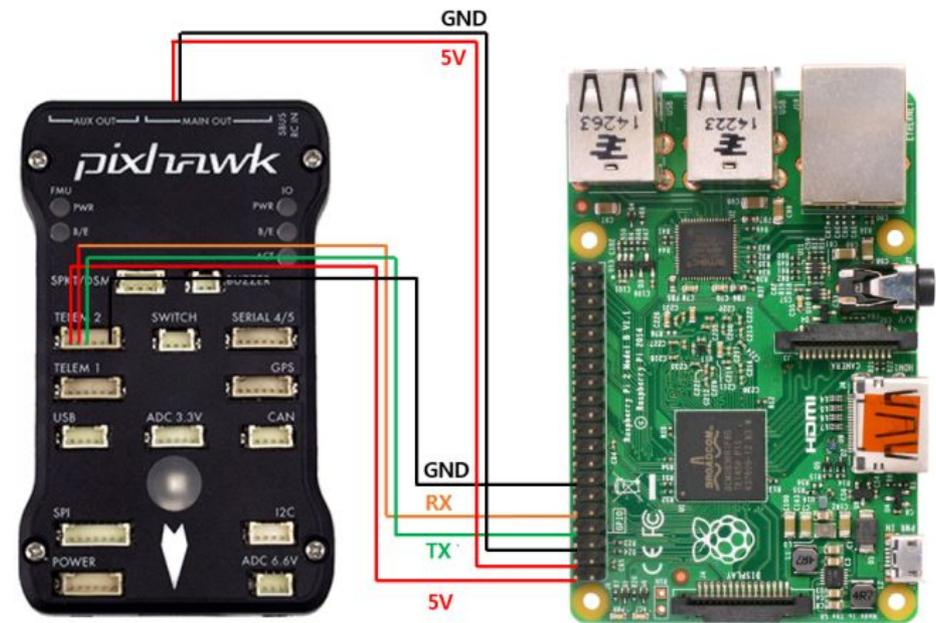
Powers the UAV. This type of battery typically come in 3S or 4S packs depending on your ESC and Motor combination



Illustrated by Jethro Hazehurst



05/02/2014



ARDU SUB ARDUPILOT



Juanmi Taboada

This is Alioli ROV

Alioli ROV
Submarine Drone



Juanmi Teboada

(Click on the image to watch the video)

Alioli ROV Submarine Drone



Juanmi Taboada

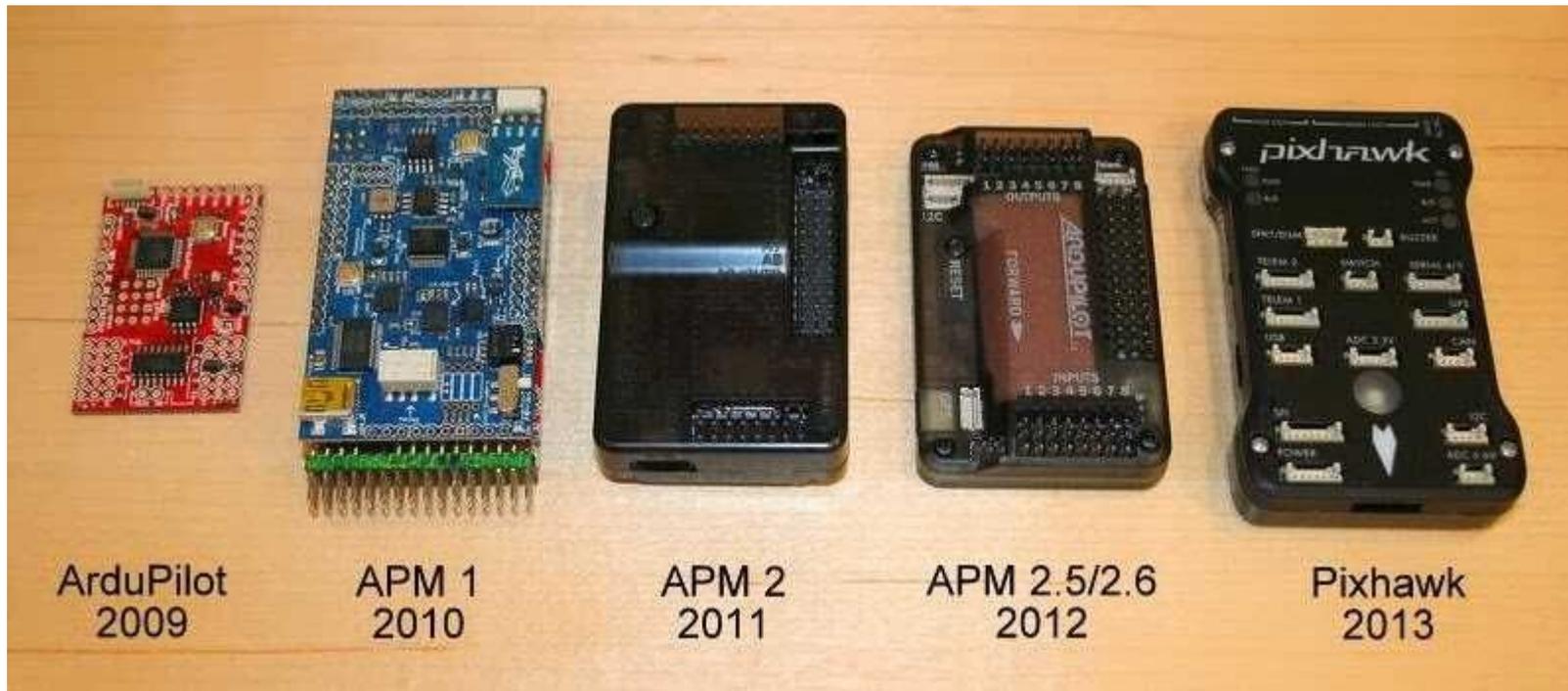


Gracias - Thank you

Ubuntu Summit 2023

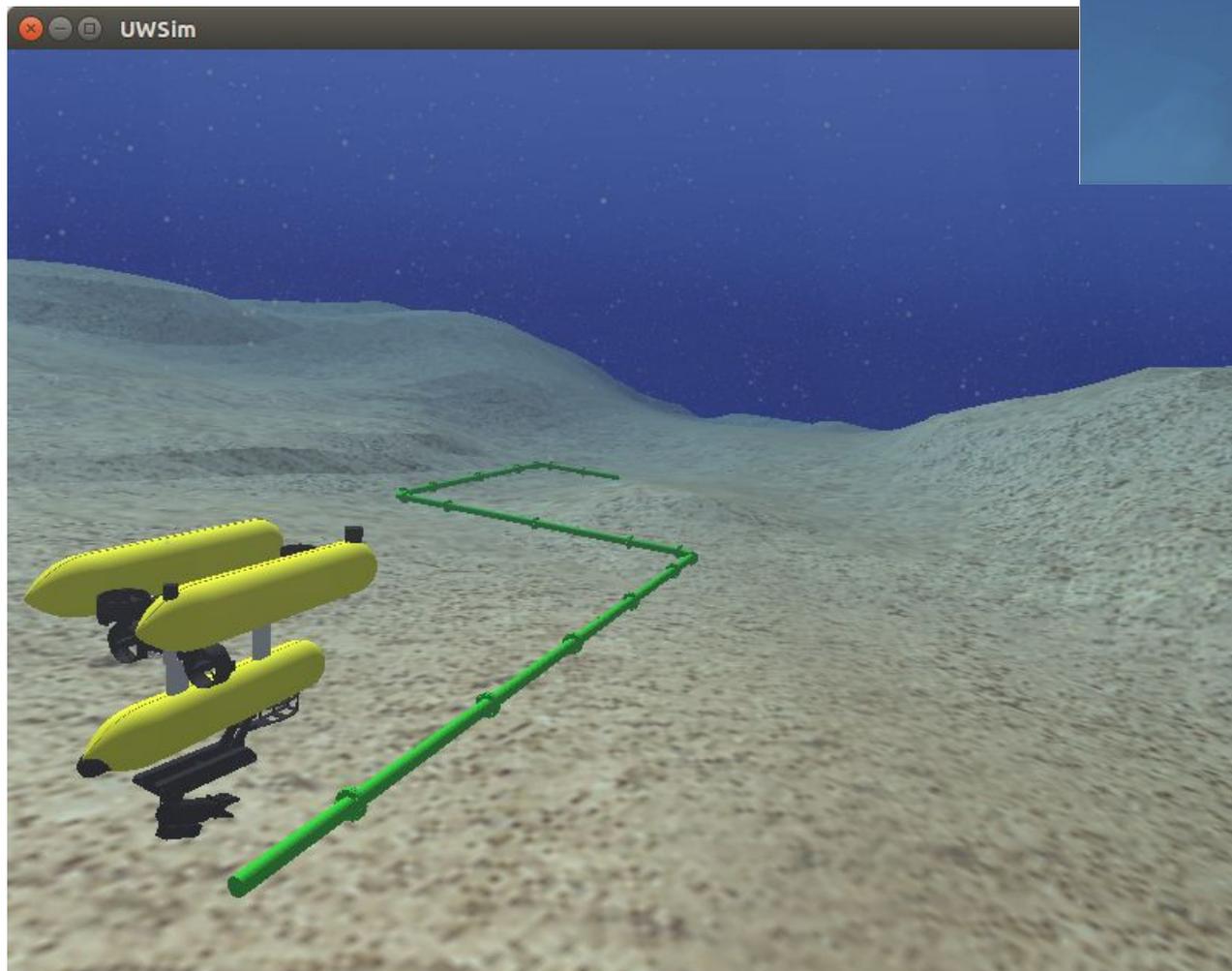
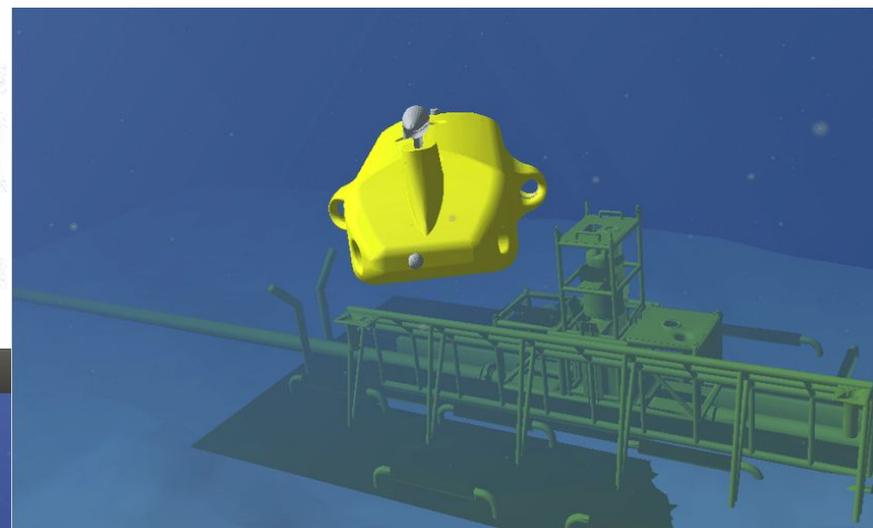
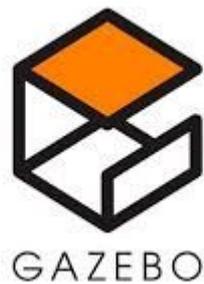
Riga, 3 November 2023

Chris Anderson & son (2007) Drone Arduino



<https://dojofordrones.com/ardupilot-vs-px4/>





UWSIM

Interactive & Robotics System Lab
University Jaume I on Valencia

