

A tale of four Islands: Communicating science and conservation about places we will never likely see

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The **Revillagigedo Islands** are about 1000 kilometers off the Pacific Coast of Mexico. These four islands were just recently designated as a UNESCO World Heritage Site and soon after, a national park of Mexico.

The islands could hardly be more different.

My research and story covers why these islands are different, and how we go about knowing and tracking their differences, given that they are so very far away from human populations. The discussion on the importance of such spots as research tools for understanding biodiversity and climate change in today's culture is a critical one for us to review.



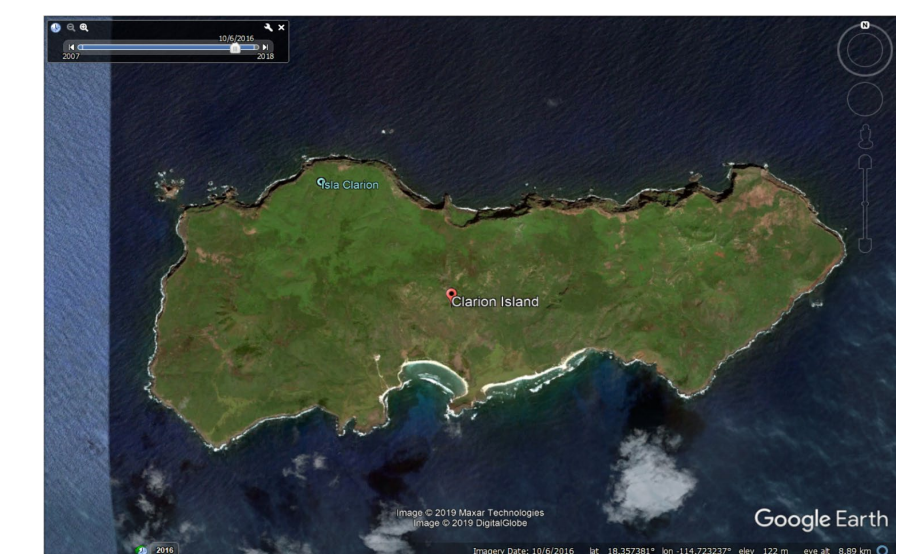
Isla San Benedicto



Isla Socorro



Isla Roca Partida



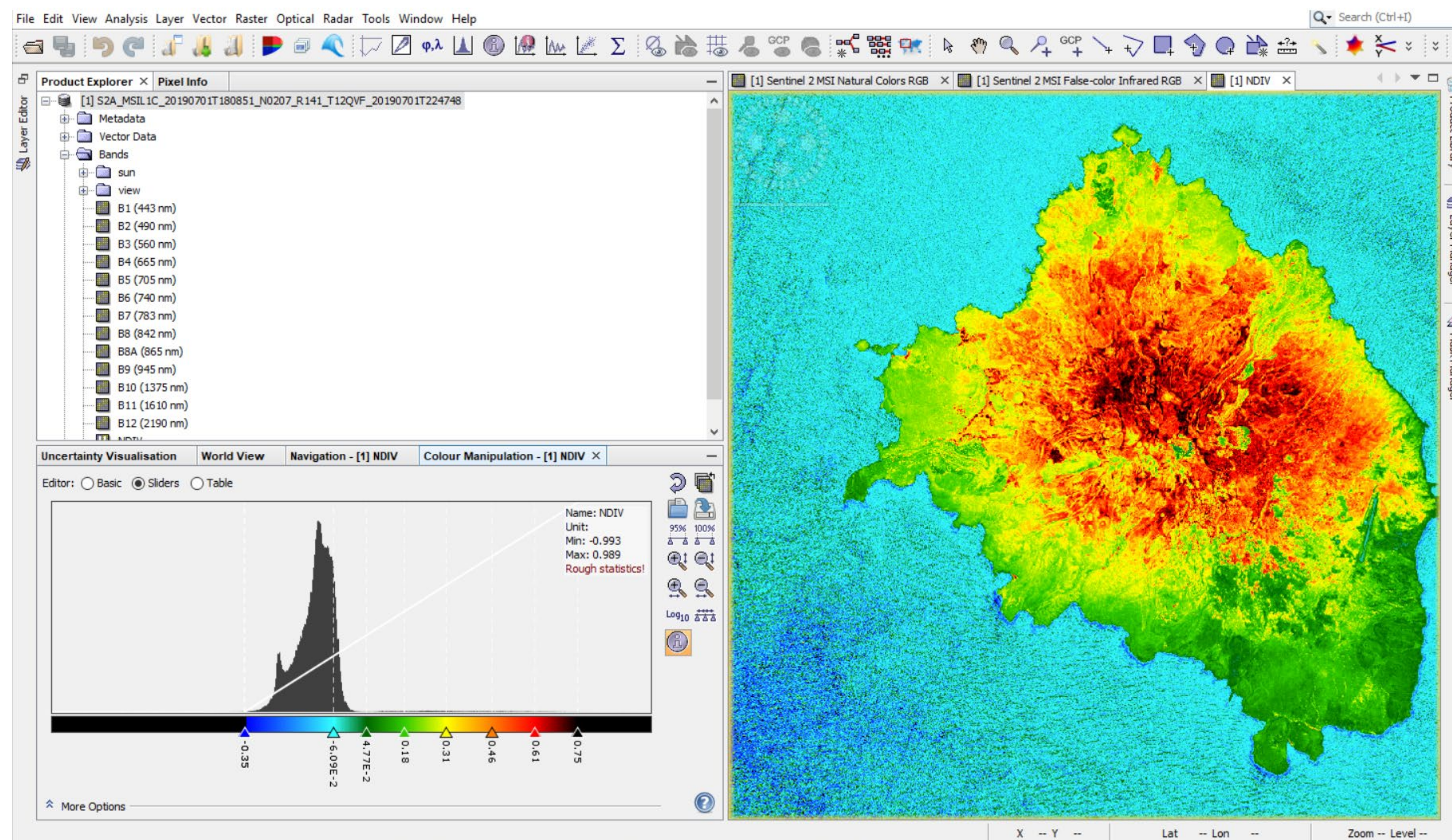
Isla Clarión

Although the geology of these four islands is basically the same, the topography and ecology of the four islands are very different.

- **Isla San Benedicto** has a large volcanic crater or caldera. It erupted in 1952 wiping out most of the plants and animals on it.
- **Isla Socorro** is much more like the volcanic tropical island of our common literature, with large prominence in the center of the island that creates weather and rain.
- **Isla Roca Partida**, as its name suggests is basically a small two-spined rock.
- **Isla Clarión** is rather flat and saddle shaped. It is dry and desert like in places.

DATA ACQUISITION

The amount of data that we can collect on the Earth today is vast. For example, just looking at data from the 8 satellites that provide free data to the global public, new data on any point on Earth is collected about 2.5 times a day. This includes images that can be downloaded and processed for scientific investigations. The European Space Agency's EDRS satellite can transmit almost 180 terabytes of Earth observation data a day or 66 petabytes a year.



Here is a processed satellite image using multiple wavelengths of light energy to determine how productive or how fast vegetation is growing on Isla Socorro. This technique is called a Normalized Difference Vegetation Index (NDVI). Isla Socorro has a large peak at its center. At 1,150 meters, the peak creates weather patterns around it and therefore creates rain. The NDVI on Isla Socorro is much larger than its flatter neighbor Isla Clarión.

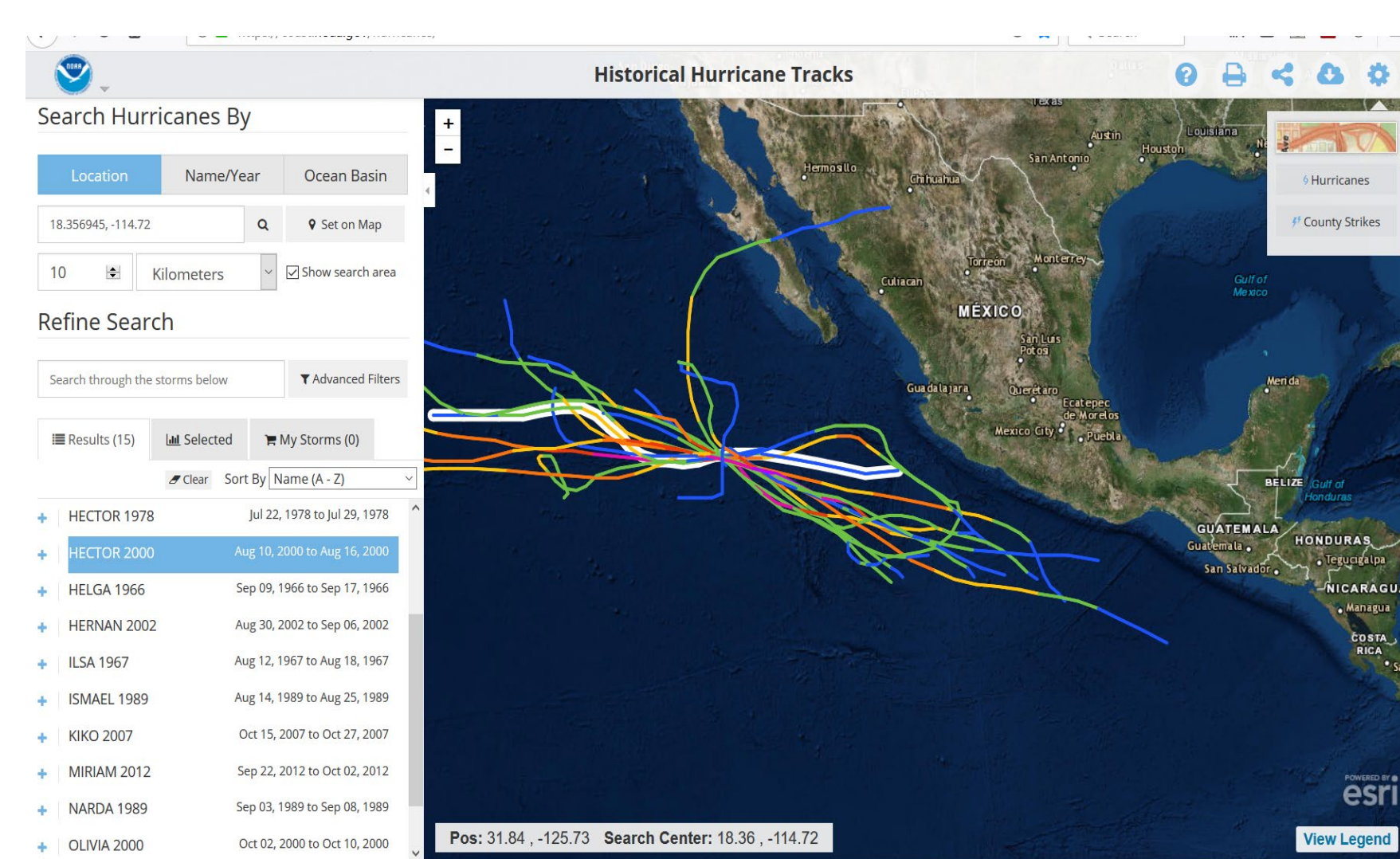
DATA MANAGEMENT

There are problems: For example, the **European Space Agency** curates and provides free access to the Land Oriented **Sentinel 2** satellite data for only the 3 most eastern Revillagigedo islands closest to land. Likewise, the **European Space Agency** curates and provides for free the Ocean Oriented **Sentinel 3** data on the most western island but not the three closest to the North American continent.

WHY SHOULD WE CARE ABOUT REMOTE LITTLE ISLANDS IN THE MIDDLE OF THE OCEAN?

There are many reasons!

- Isolated landscapes such as these remote islands or the Tepuis of Venezuela host many endemic organisms. Broadly speaking these are the plants and animals only found at these locations and nowhere else on Earth. Being endemic is also a good indicator of being rare and with the exploration/colonization of humans, many have become extinct (Think of the dodo bird from another remote Island, Mauritius, in the Indian Ocean)
- In the last 200 years, the Hawai'ian islands lost 32 birds, 32 insects and 72 molluscs to extinction.
- Islands, by their nature, can support reefs that in turn support more biodiversity including other endemic marine species.
- Because of the limited ingress and egress of species, islands create illustrative examples of habitat monitoring and how they respond to environmental stresses.
- Remote areas challenge research to be creative in the acquisition of data to direct their conservation efforts.



Enormous amounts of historical meteorological data allow researchers to recreate the paths of land-altering storms such as hurricanes and cyclones. Note the number and intensity of hurricanes passing across and nearby Isla Clarión.

Conclusions:

So, there we have it, a set of remote islands with rare endemic species subject to the processes of our current world and changing climate. With very few people visiting the islands and with limited invasive species, we can watch from a distance using remotely sensed satellite data on how the flora and fauna survive.



Open source mapping tools such as QGIS allow researchers to analyze and process data to determine size of forested habitats, lengths of rivers and ridgelines, and point locations for plant and animal species.

Acknowledgements:
European Space Agency Copernicus Sentinel data. Retrieved June 2019 from Copernicus Data Hub
Evans, Kip. Mission Blue Staff Photographer Imagery. Retrieved January 2020
Google Earth Imagery
NOAA National Ocean Service Historical Hurricane Data/ESRI Data. Retrieved June 2019.
USGS Landsat-7 image, June 2019
UNESCO World Heritage List - Archipiélago de Revillagigedo. <https://whc.unesco.org/en/list/1510/>
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