

EarthQA : A Question Answering Engine for Earth Observation Data Archives

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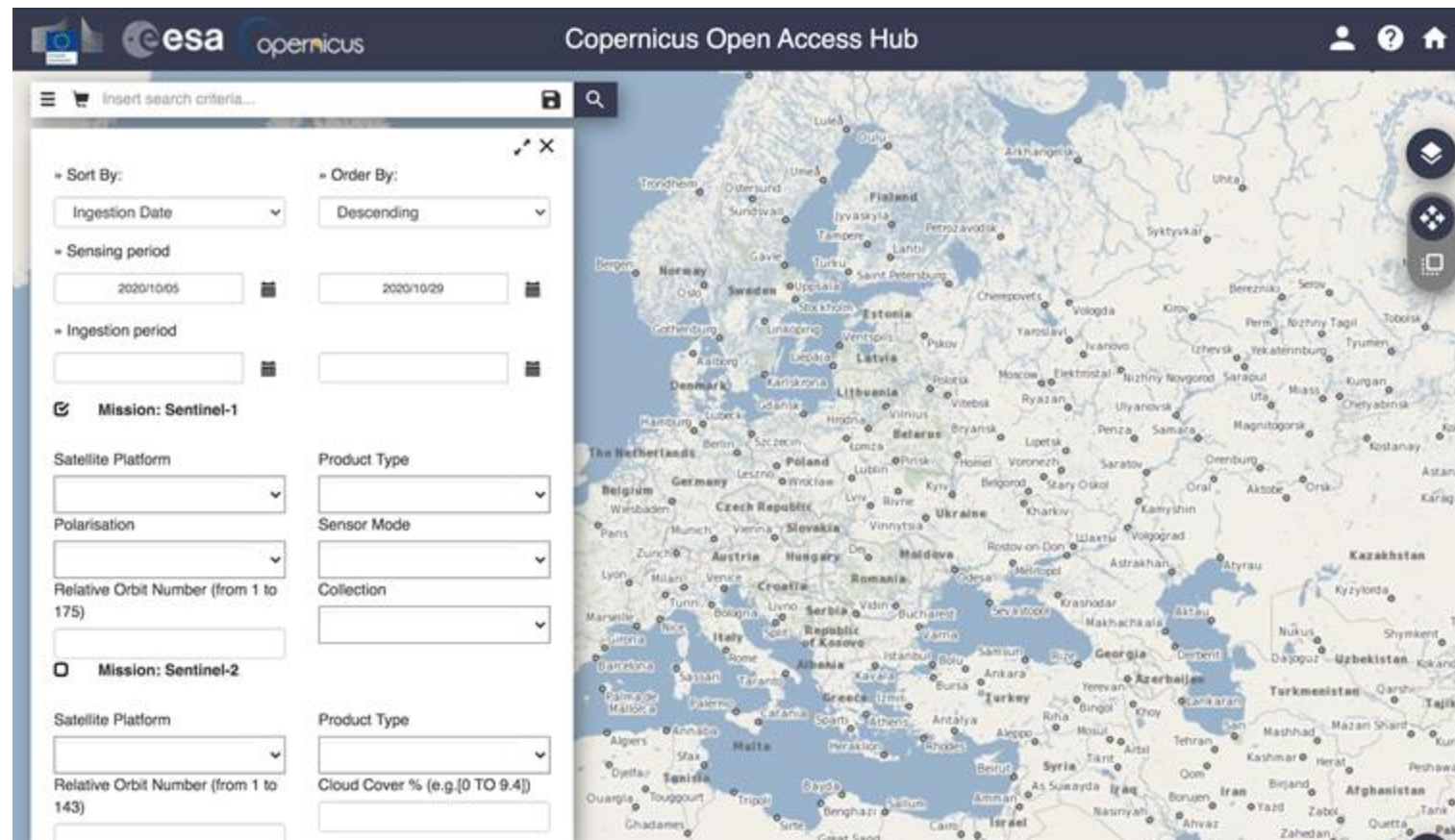
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EO Product Search Example - Copernicus Open Access Hub

- Provides complete, free and open access to Sentinel-1, Sentinel-2, Sentinel-3 and Sentinel-5P user products (<https://scihub.copernicus.eu>).



EO product search - Copernicus Open Access Hub

The screenshot displays the Copernicus Open Access Hub search interface. The top navigation bar includes the ESA and Copernicus logos, the title "Copernicus Open Access Hub", and user icons. A search bar at the top left contains the text "Insert search criteria...".

The left sidebar shows search results for 95978 products, ordered by Ingestion Date. The search criteria are: `(beginPosition:[2020-10-05T00:00:00.000Z TO 2020-10-29T23:59:59.999Z] AND endPosition:[2020-10-05T00:00:00.000Z TO 2020-10-29T23:59:59.999Z]) AND ((platformname:Sentinel-1))`. The results list includes:

- S1A SAR-C S1A_IW_GRDH_1SDH_20201029T202908_20201029T202925...**
Download URL: [https://scihub.copernicus.eu/dhus/odata/v1/Products\('c1a29082925'\)](https://scihub.copernicus.eu/dhus/odata/v1/Products('c1a29082925'))
Mission: Sentinel-1 Instrument: SAR-C Sensing Date: 2020-10-29T20:29:08.000Z
- S1A SAR-C S1A_S6_GRDH_1SDV_20201029T214358_20201029T214427...**
Download URL: [https://scihub.copernicus.eu/dhus/odata/v1/Products\('e3584427'\)](https://scihub.copernicus.eu/dhus/odata/v1/Products('e3584427'))
Mission: Sentinel-1 Instrument: SAR-C Sensing Date: 2020-10-29T21:43:58.000Z
- S1A SAR-C S1A_EW_GRDM_1SDV_20201029T205735_20201029T20575...**
Download URL: [https://scihub.copernicus.eu/dhus/odata/v1/Products\('573520575'\)](https://scihub.copernicus.eu/dhus/odata/v1/Products('573520575'))
Mission: Sentinel-1 Instrument: SAR-C Sensing Date: 2020-10-29T20:57:35.000Z
- S1A SAR-C S1A_EW_OCN_2SDV_20201029T205735_20201029T20575...**
Download URL: [https://scihub.copernicus.eu/dhus/odata/v1/Products\('3573520575'\)](https://scihub.copernicus.eu/dhus/odata/v1/Products('3573520575'))
Mission: Sentinel-1 Instrument: SAR-C Sensing Date: 2020-10-29T20:57:35.000Z
- S1B SAR-C S1B_IW_SLC_1SDV_20201029T195322_20201029T195349...**
Download URL: [https://scihub.copernicus.eu/dhus/odata/v1/Products\('85322195349'\)](https://scihub.copernicus.eu/dhus/odata/v1/Products('85322195349'))
Mission: Sentinel-1 Instrument: SAR-C Sensing Date: 2020-10-29T19:53:22.000Z

The right side of the interface features a map of Europe and the Mediterranean region. Red rectangular overlays on the map indicate the geographic locations of the search results. A sidebar on the right contains map navigation controls. At the bottom, there is a pagination control showing "Products per page: 150" and "page: 1 of 640".

Our Vision

EO product search should be like searching with Google and it should also target non-expert EO data users!



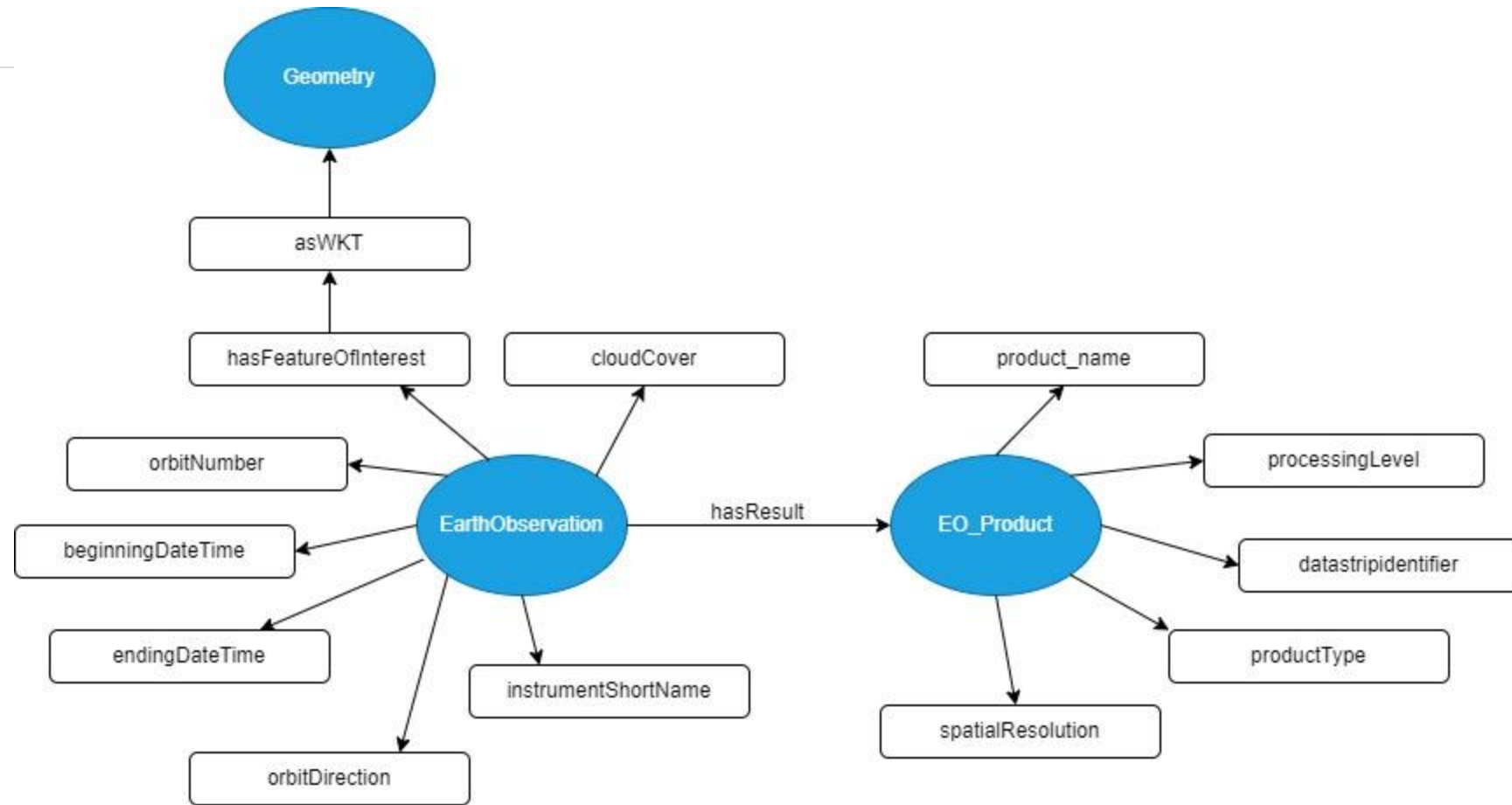
The EarthQA Question Answering Engine

- EarthQA is based on the following technologies:
 - **Question answering**
 - **Knowledge graphs**
 - **Ontologies**
- We consider the **EO product search problem** as a **question answering problem over knowledge graphs encoded using appropriate ontologies.**

The Two EarthQA Knowledge Graphs

- A knowledge graph encoding metadata of EO products from the CREODIAS archive. This is part of the Copernicus knowledge graph.
- The geospatial knowledge graph YAGO2geo (<https://yago2geo.di.uoa.gr/>) containing information about geographic objects (e.g., lakes) and their geometries (e.g., polygons).

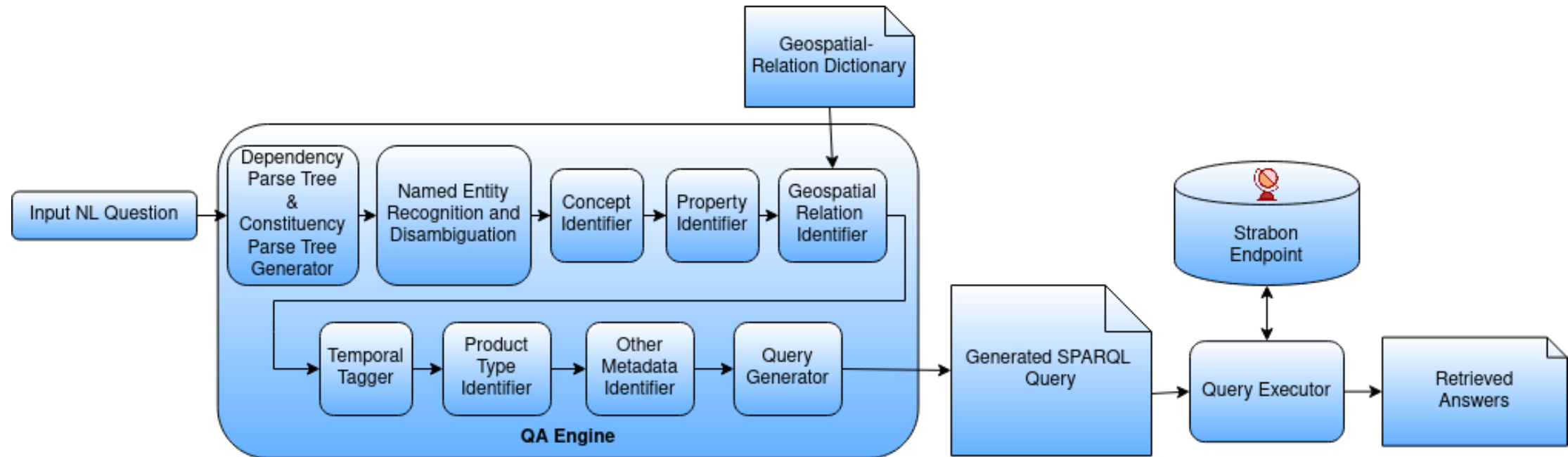
A Subset of the EarthQA Ontology



EarthQA - Capabilities

- In its current version, EarthQA accepts questions in **natural language (English)** that ask for EO products having certain properties and returns links to such products. **The properties can refer to EO product metadata (encoded in the Copernicus ontology) and relevant geographical knowledge from YAGO2geo.**
- Example user requests:
 - Find **Sentinel-1** products that show Etna in **March 2018**.
 - Find **Sentinel-2 MSI** products that show Etna, have cloud cover below 10% and have been taken during **March 2017 or 2018**.
 - Retrieve all **GRD Sentinel-1 images** that cover the Black Sea and have been taken during the period **1/06/19-1/15/19**.
 - Find **Sentinel-3A Water Full Resolution** products that covers Corsica with the data collected in **January 2018**.

EarthQA – Software Architecture



Demo at <http://earthqa.di.uoa.gr/>

The screenshot displays the EarthQA web application interface. At the top left is the EarthQA logo, and at the top right are navigation links for "How It Works", "About", a settings icon, and a UK flag. A search bar contains the query "Find Sentinel-1 products that show Etna in March 2018". Below the search bar is an "Advanced Options" link. The main content area is divided into three sections: "Info", "Generated Query", and "Map".

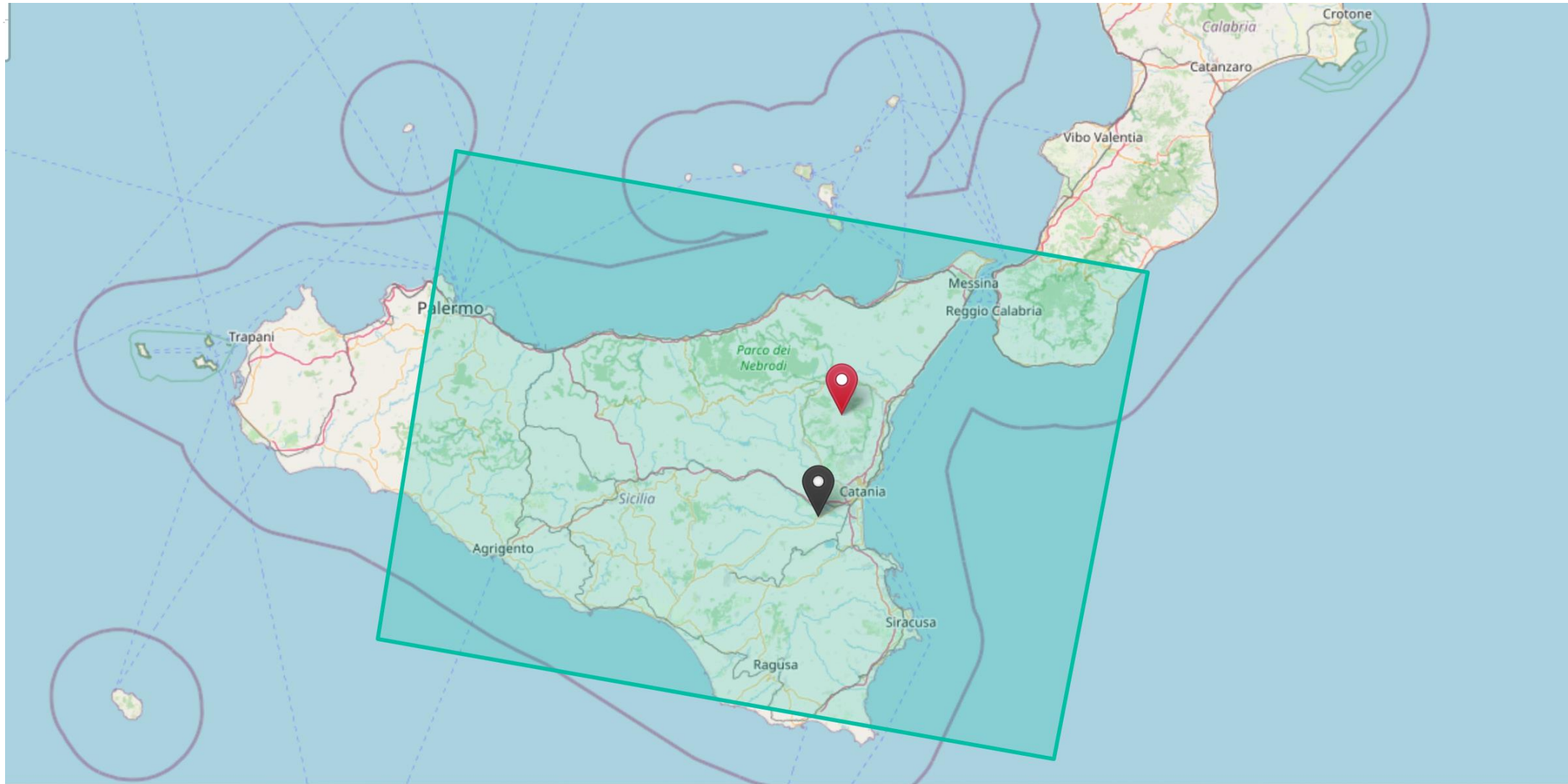
Info

Generated Query.	Source	Query
Query #1 of 1 total queries	EODATA	<pre>select distinct ?x where { ?hex <http://ws.creodias.eu/metadata/attribute#feature> ?x . ?hex ?pred <http://dbpedia.org/resource/Mount_Etna> . ?x <http://ws.creodias.eu/metadata/attribute#title> ?title . ?x <http://ws.creodias.eu/metadata/attribute#geometry> ?geom . ?x <http://ws.creodias.eu/metadata/attribute#missions></pre>

Map

The map section shows a satellite-style map of the region around Mount Etna, with labels for Calabria, Catanzaro, and Crotona. A search area is overlaid on the map, and a zoom control is visible on the left side.


<http://earthqa.di.uoa.gr/>



EarthQA as Baseline in our ESA Project

DA4DTE
DEMONSTRATOR PRECURSOR DIGITAL ASSISTANT INTERFACE FOR DIGITAL TWIN EARTH

e-geos
AN ASI / TELESPAZIO COMPANY


HELLENIC REPUBLIC
National and Kapodistrian
University of Athens
— EST. 1837 —

Technische
Universität
Berlin 

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