Virtual Geology Field Trip: Exploring Torres del Paine & Altiplano

Geofacets Webinar

September 24, 2020

Sandra Merten (Ph.D.) – Senior Product Manager Geofacets

About today’s presenter

Dr. Sandra Merten

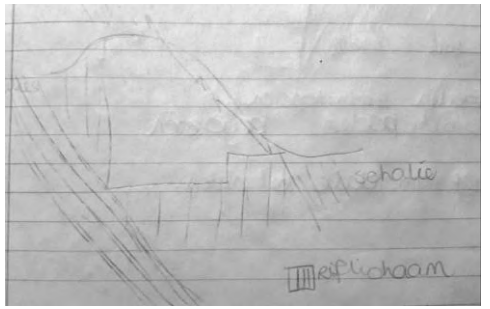
Senior Product Manager – Geofacets

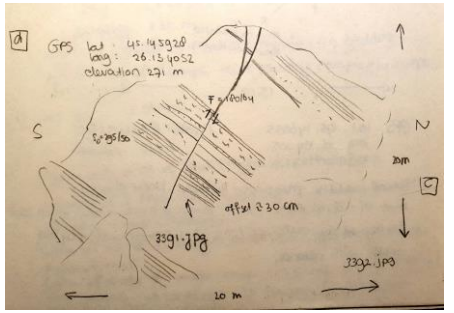
Sandra Merten is responsible for the ongoing development of Geofacets. She joined Elsevier in 2010 and managed the successful release of several major Geofacets product enhancements, including the launch of more than 1 million easy-to-access figures and tables and a new redesigned Geofacets user interface. In her current role, she focuses on the development of analytical decision support solutions and services to help answer applied geoscience problems in the industry and academia. She has a M.Sc. in Structural Geology & Tectonics and a Ph.D. in Thermochronology & Tectonics from the VU University in Amsterdam.

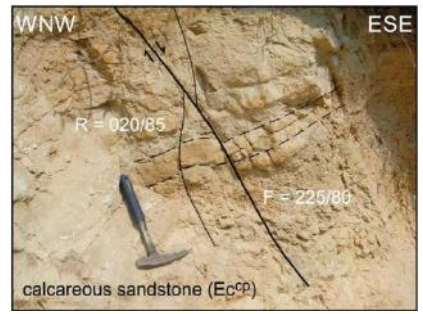
LinkedIn: https://www.linkedin.com/in/sandramerten/

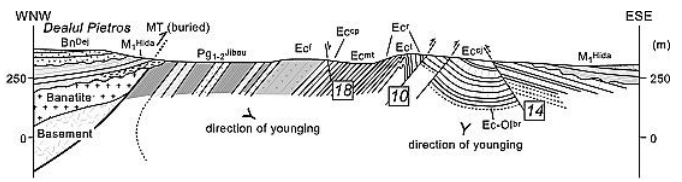
Field trips are really important in Geosciences

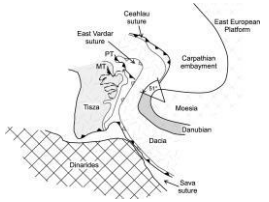
- Experience geology in the field
- Develop field skills: Learn to observe and understand what you see
- Collect samples or data
- Analyze and synthesize
- Develop geological knowledge











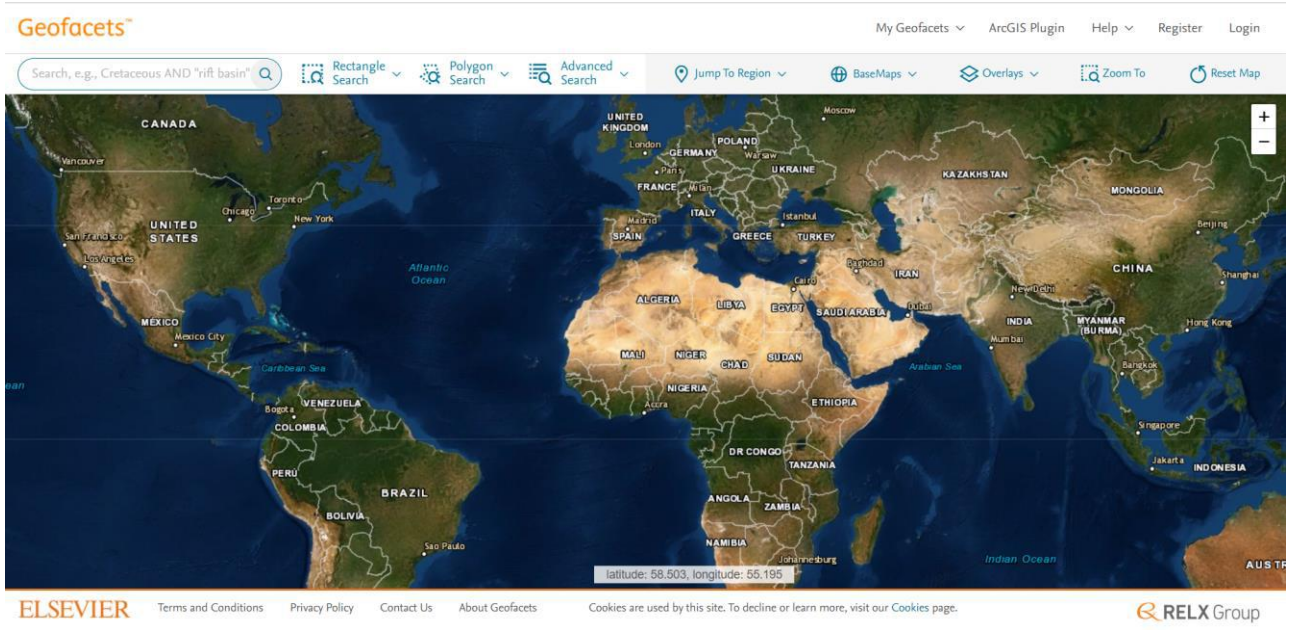
But it is not always possible to explore onsite

- Difficult to get to some areas (e.g., remote areas)
- High-risk areas (e.g., due to geopolitical tensions)
- Budget/resource constraints
- A pandemic

Then virtual field trips are the next best thing!

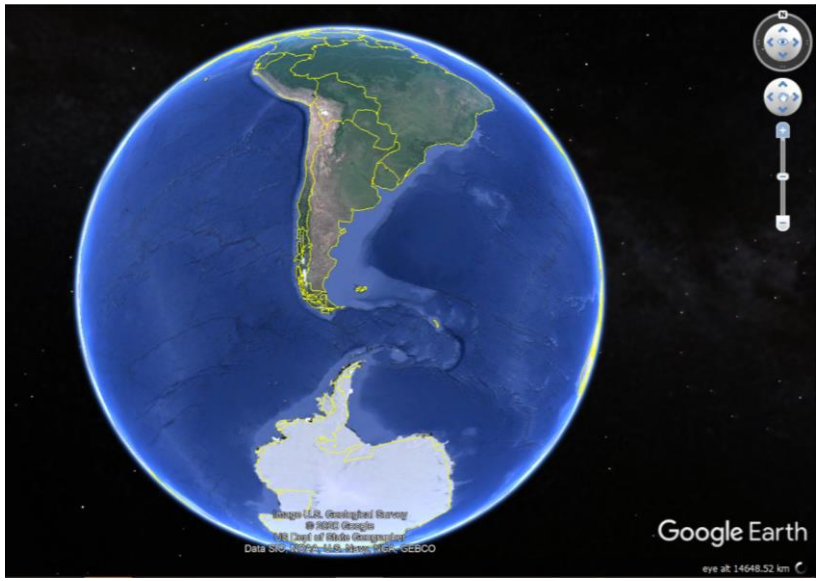
For today's virtual field trips we will use:

Geofacets



+

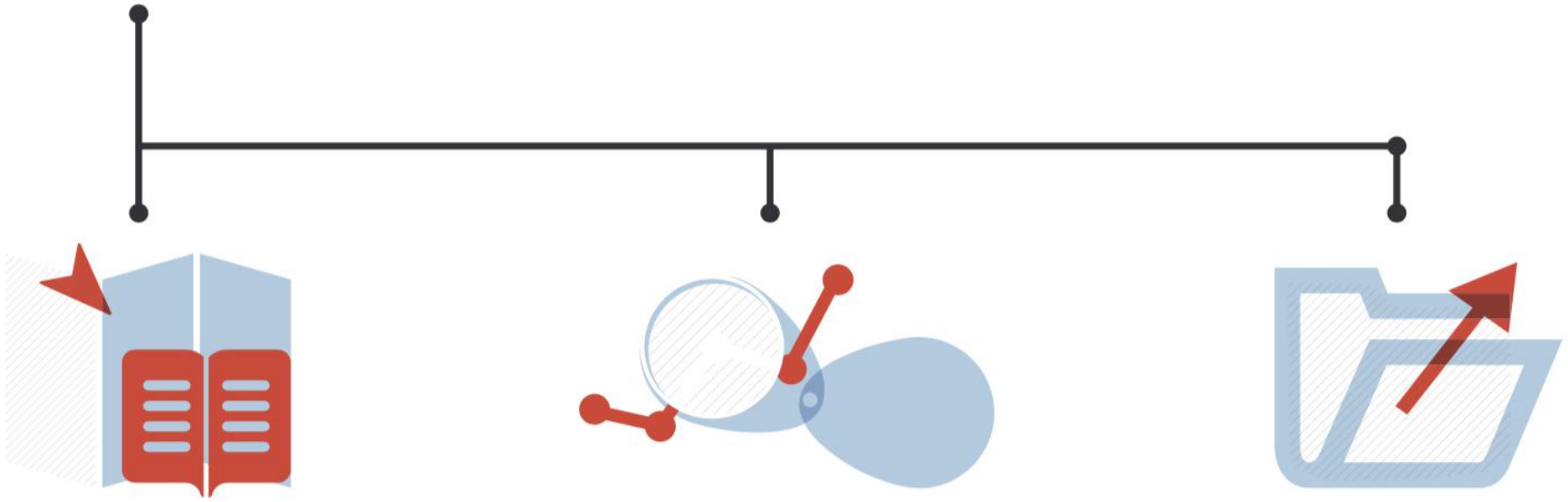
Google Earth



ELSEVIER

What is Geofacets?

Geofacets answers geoscience questions by combining:



Essential knowledge

Vast, vetted database of geoscience information and data sourced from scientific publications

Easy discovery

Spatially-smart search targeting, delivering results up to 50% faster than traditional methods

Seamless integration

Actionable content can be fed directly into ArcGIS, Petrel, Excel and more for further analysis and interpretation

ELSEVIER

Essential Knowledge

2.2 million+
maps, figures, and tables

Multiple Sources in One Place:

ELSEVIER · SEG Society of Exploration Geophysicists · WILEY · GSL

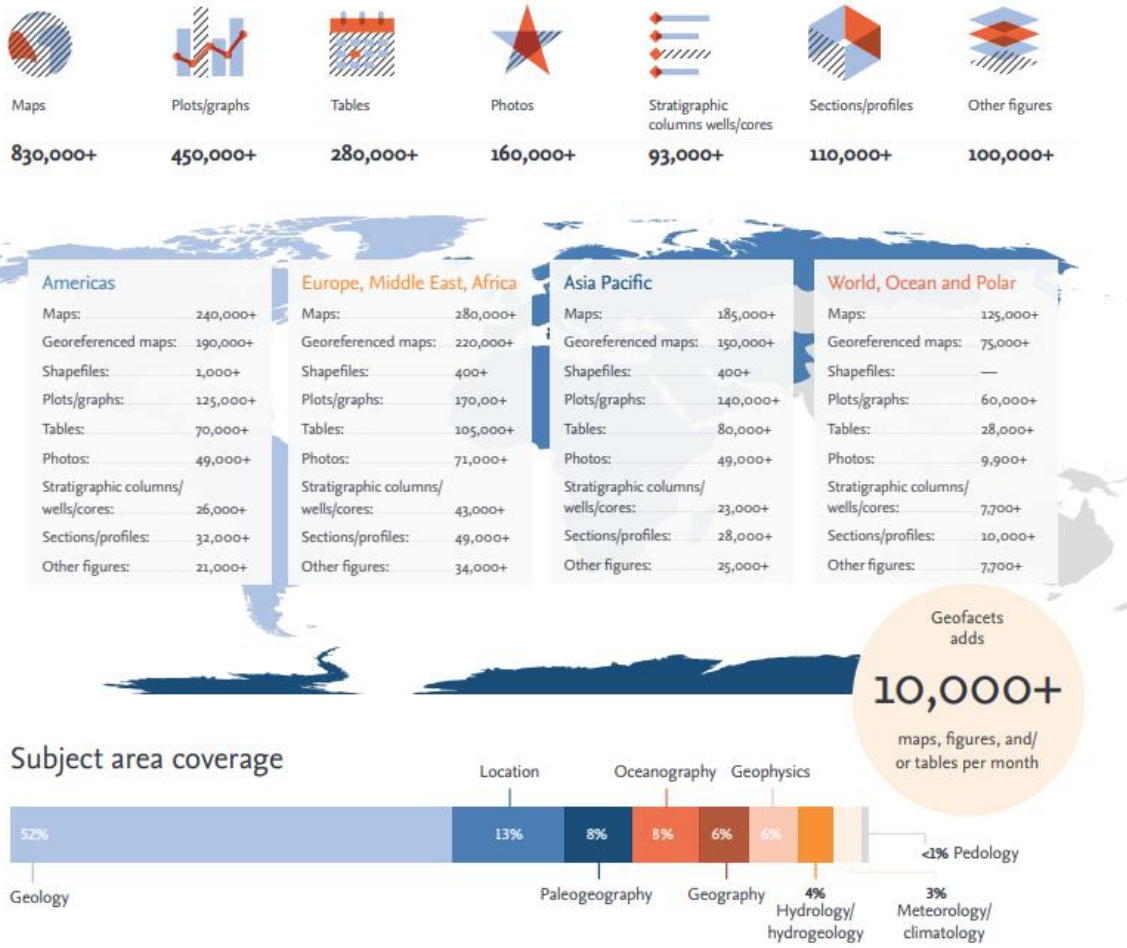
SEPM Society for Sedimentary Geology · AAPG · AGU American Geophysical Union · Bureau of Economic Geology

IPA Indonesian Petroleum Association · CSPG Canada's Energy Geoscientists · The Geological Society of America · SPE International Society of Petroleum Engineers

CNH Comisión Nacional de Hidrocarburos · SENER Secretaría de Energía · Society of Economic Geologists Founded 1920

Content sourced from USGS

Extracted and Enriched:



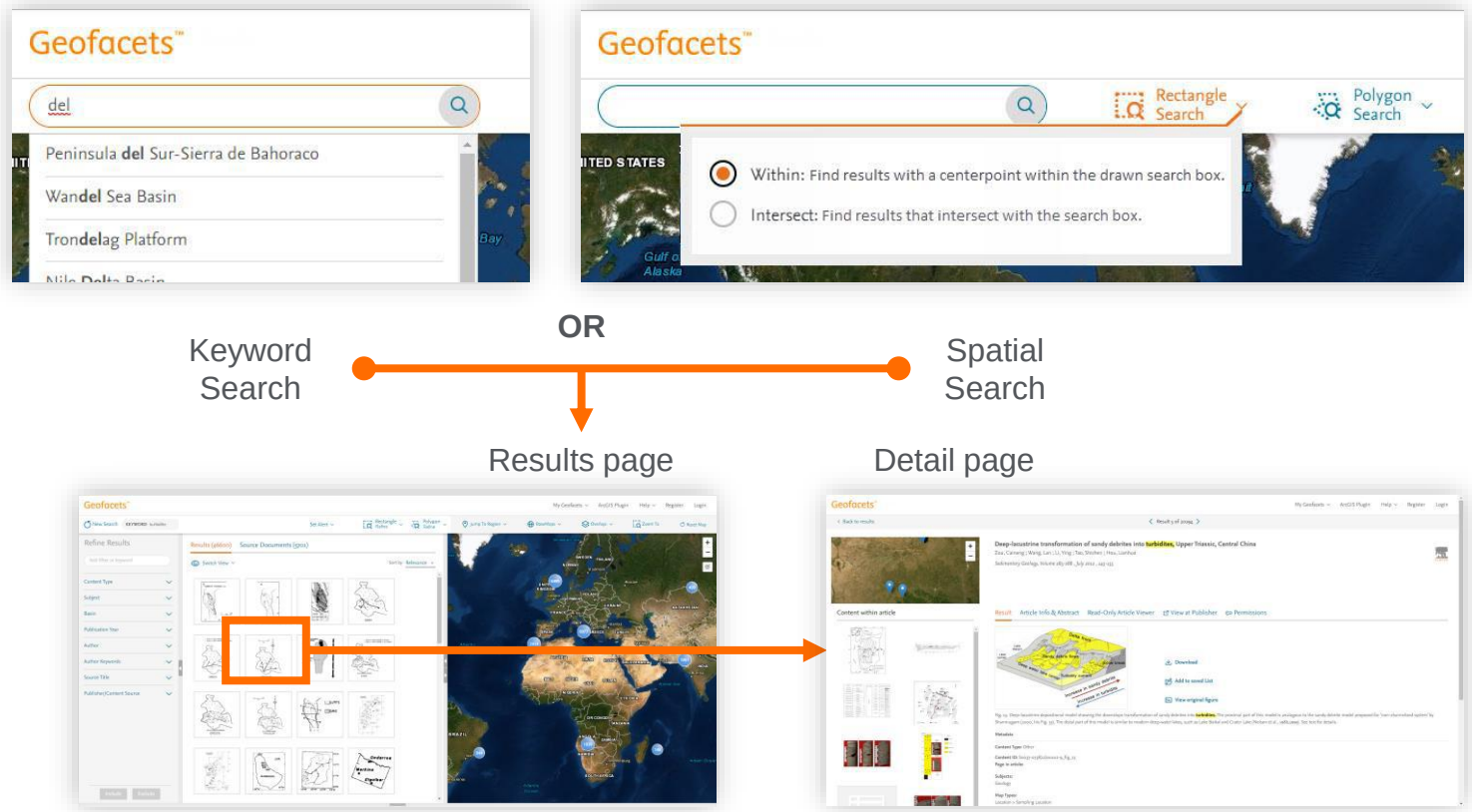
Easy Discovery

Geoscience domain based searches:

- Search by region, country, basin, subject area, location and more

Metadata enhancements:

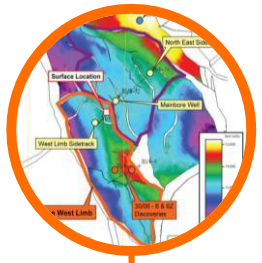
- All content is metadata-enhanced
  - Maps are enhanced with additional metadata and georeferenced (for ~70% of maps)
- Location (coordinates and basin/country/region metadata)
- Content type (what type of figure)
- Subject area (Geology, geophysics, etc.)

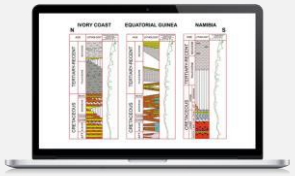


ELSEVIER

Seamless Integration

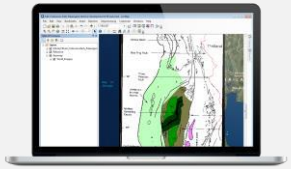
Downloadable and can be integrated into a variety of third party software platforms





PowerPoint

TIFF, JPEG



ArcGIS

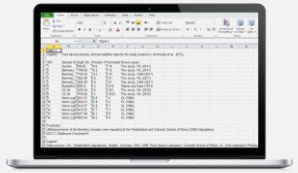
GeoTIFF, Shapefile, TIFF, JPEG

Geofacets for ArcGIS
Go from hypothesis to validation to analysis all in one place

Petrel

GeoTIFF, Shapefile, TIFF, JPEG

Geofacets Connector for Petrel and Studio
Save time and quickly access geoscience information and data without leaving Petrel



Excel

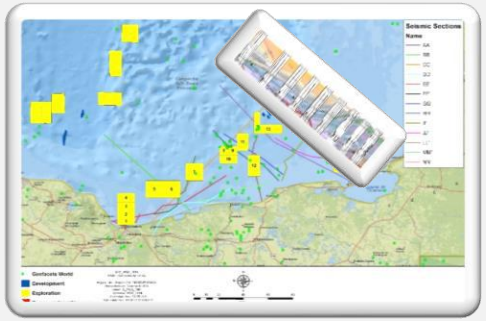
XLSX

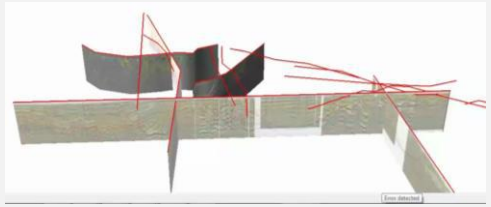
Google Earth

KMZ

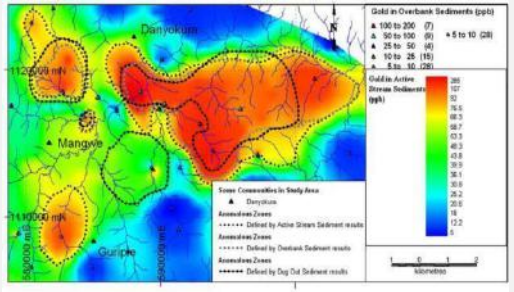
In which situations can Geofacets help—examples:

Find information for a specific geographic area, e.g., when **exploring a basin** or **preparing for a lease sale**



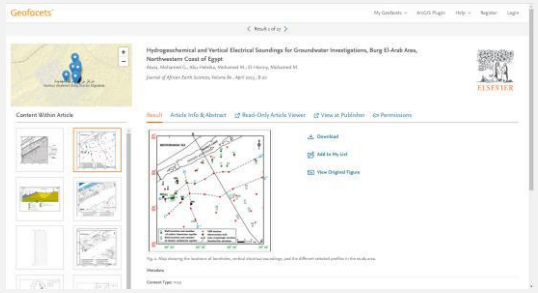


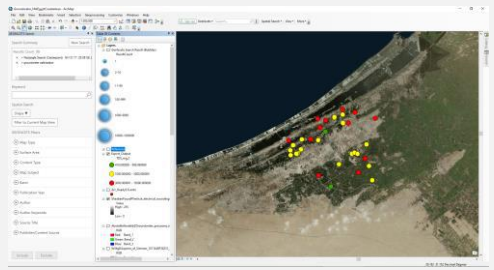
Find data to analyze the characteristics of a deposit, e.g., what are the geochemical, geophysical and geological properties of the deposit?



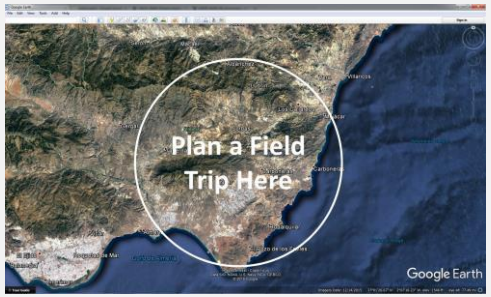
Sampling stations	Afema gold mining site									
	Al	As	Cd	Co	Cr	Cu	Mn	Ni	Pb	Zn
Industrial stations										
F1	0.29	32.5	3.83	0.12	0.91	2.59	0.02	0.33	1.43	0.21
F2	0.09	47.9	4.66	0.23	1.02	0.54	0.07	0.42	0.29	0.26
F3	0.74	168	5.38	1.00	1.70	1.67	0.28	1.10	0.31	1.17
F4	0.12	54	4.71	0.24	0.51	0.36	0.13	0.36	0.09	0.13
F5	0.15	141	4.45	0.21	0.68	0.84	0.11	0.38	0.15	0.16
Average	0.18	79.3	4.65	0.29	0.76	0.72	0.12	0.43	0.23	0.24
SD	0.24	55.00	0.50	0.33	0.42	0.85	0.09	0.29	0.51	0.40
Artisanal stations										
F6	0.43	4.04	5.24	1.14	1.89	0.82	0.55	1.08	0.17	0.90
F7	0.56	1.21	4.20	0.71	2.29	0.79	0.21	1.12	0.21	0.64
F8	0.61	1.82	4.35	0.79	2.61	0.91	0.27	1.33	0.06	0.83
F9	2.16	2.70	2.30	1.62	14.4	3.86	0.20	7.24	0.33	1.98
F10	1.34	1.44	4.03	1.09	8.47	2.59	0.12	3.85	0.23	1.54
Average	0.76	2.38	4.38	0.98	4.03	1.31	0.32	2.01	0.18	0.99
SD	0.66	1.03	0.97	0.32	4.92	1.25	0.15	2.43	0.09	0.51
Non-mining stations										

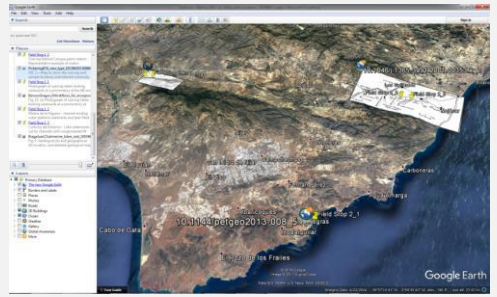
Find information on a specific geological feature or topic to **answer research questions** or **find analogs**





Find maps and outcrop photos, e.g., to **prepare for a field trip** or do a **virtual geology field trip**





ELSEVIER

It’s virtual, so we can go anywhere we like!

Sorbas Basin – Southeast Spain

Colorado Front Range – Rocky Mountains, USA

Anderson et al. (2013) – From Geofacets

Tolbachik Volcano – Kamchatka Peninsula, Russia

Lithium Altiplano – Bolivia

Torres del Paine – Chile

Leuthold et al. (2012) – From Geofacets

REE – Brazil

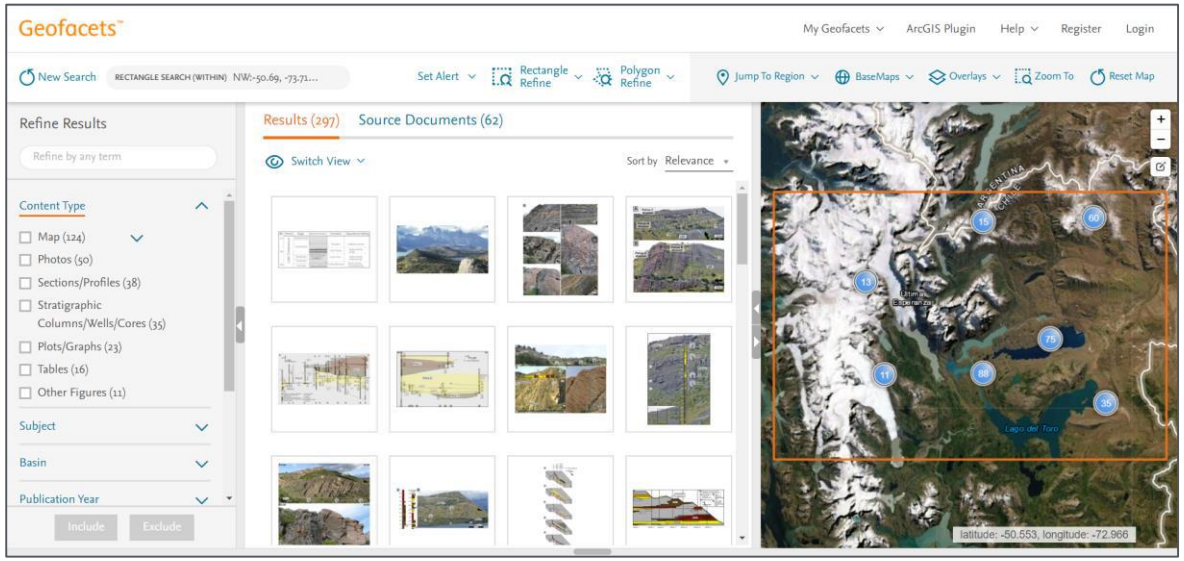
Santana et al. (2015) – From Geofacets

ELSEVIER

Torres del Paine (Chile)

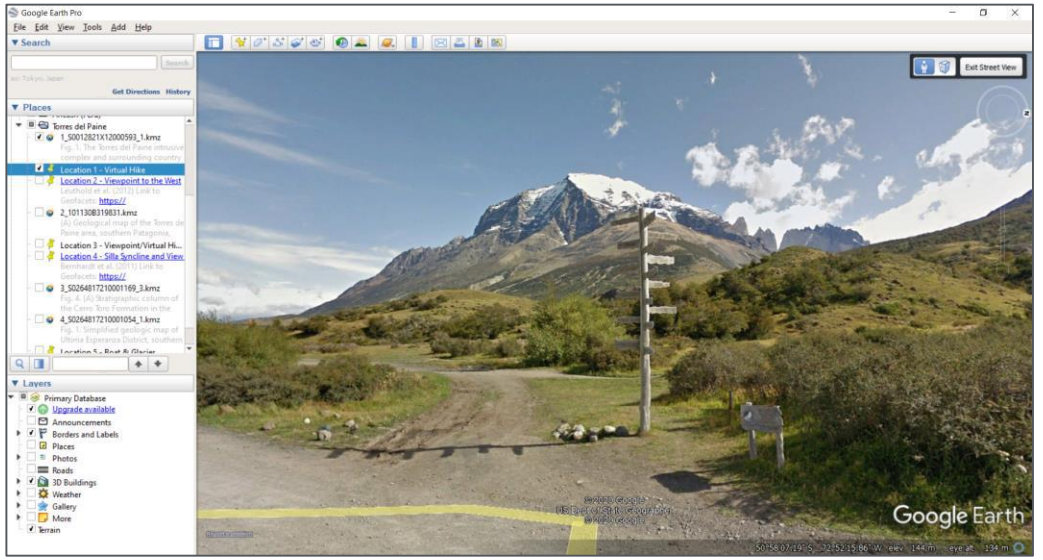
"I would like to explore the geology of Torres del Paine"

Geofacets



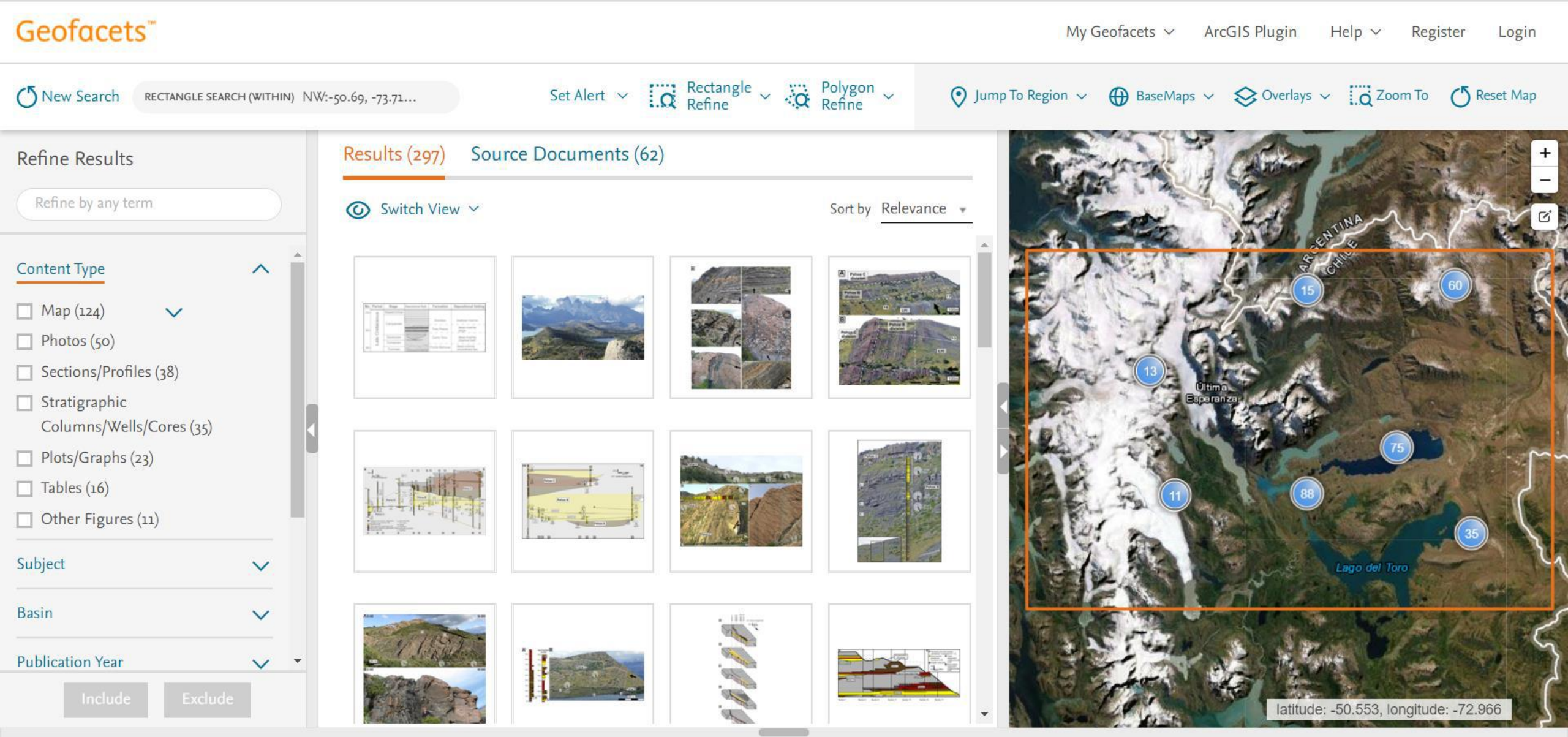
+

Google Earth

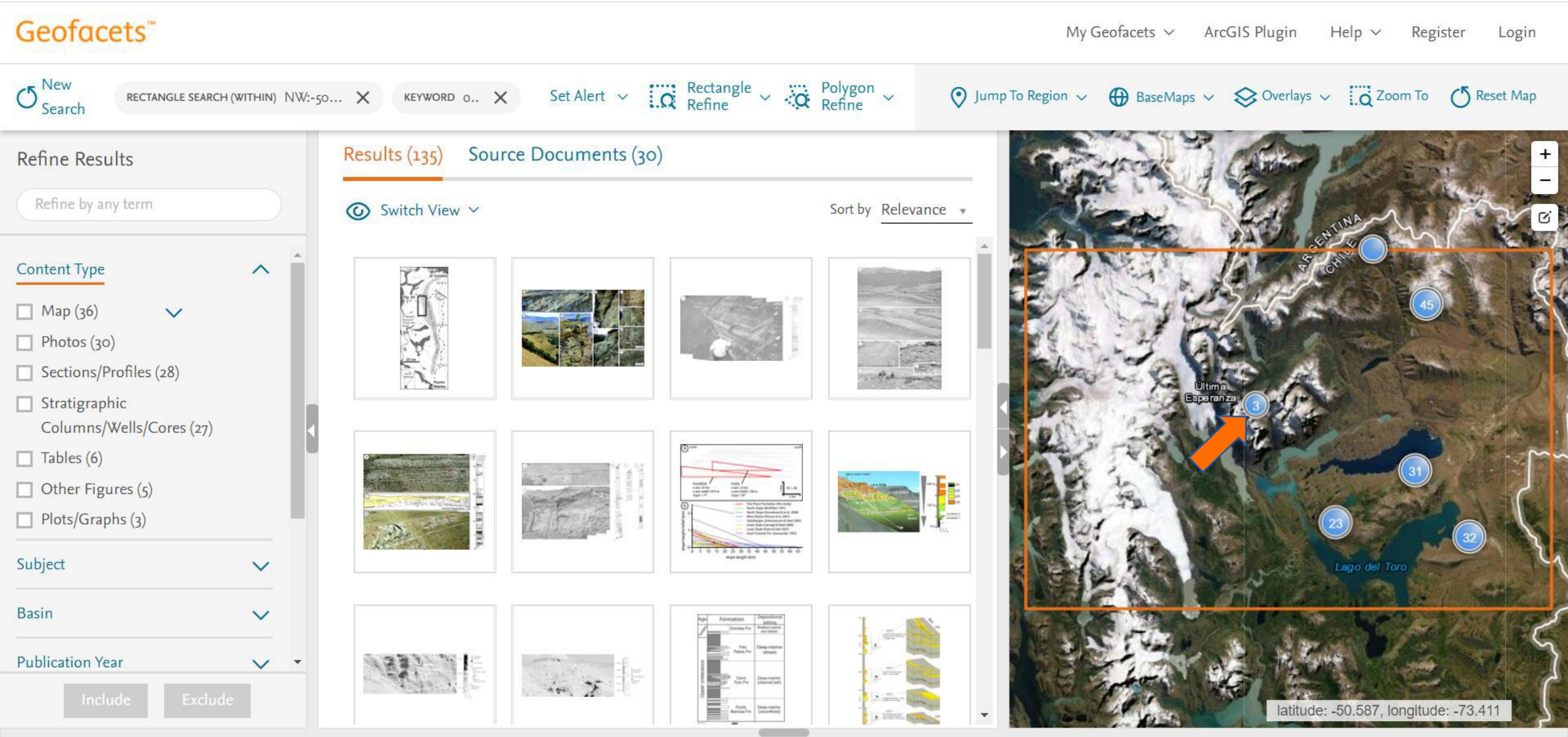


ELSEVIER

Spatial Search Torres del Paine / Word refine *Outcrop*



Explore Results on Interactive Map



Explore Results on Interactive Map – Geological Map

Geofacets™

My Geofacets | ArcGIS Plugin | Help | Register | Login

Result 1 of 3

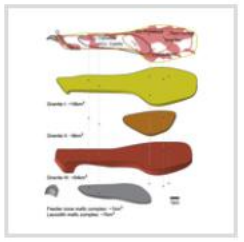
Time resolved construction of a bimodal laccolith (Torres del Paine, Patagonia)

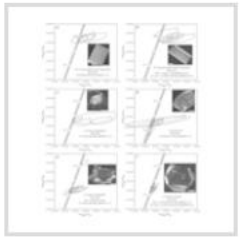
Leuthold, Julien; Müntener, Othmar; Baumgartner, Lukas P.; Putlitz, Benita; Ovtcharova, Maria; Schaltegger, Urs

Earth and Planetary Science Letters, Volume 325-326 , April 2012 , 85-92

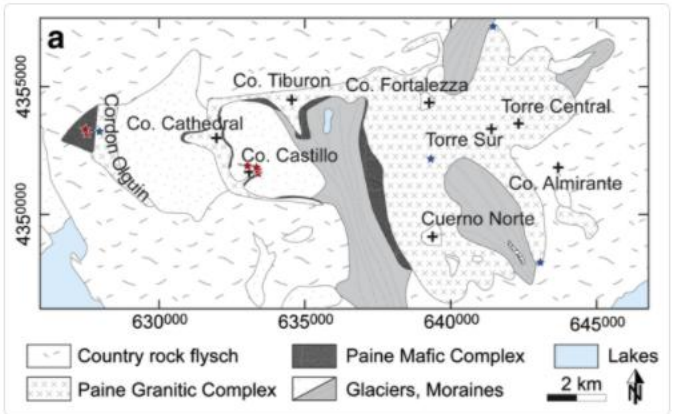
ELSEVIER

Content Within Article





Result | Article Info & Abstract | Read-Only Article Viewer | View at Publisher | Permissions



Download

Add to My List

View Original Figure

Fig. 1. The Torres del Paine intrusive complex and surrounding country rocks. (a) Simplified geological map (modified after Michel et al., 2008); (b) Panorama photograph of the Torres del Paine mafic complex (PMC), the Paine granitic complex (PGC) and the country rock flysch (CR) (photograph taken by Robert Bodner, from the Co. Fortalezza summit, toward west). Each identified granitic and mafic unit was built up by stacking of several meter to decameter thick sills. The locations of the dated samples from the Paine mafic complex are indicated by red

Source Article Info & Abstract

Geofacets™ My Geofacets ArcGIS Plugin Help Register Login

Result 1 of 3

Time resolved construction of a bimodal laccolith (Torres del Paine, Patagonia)

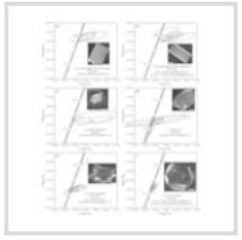
Leuthold, Julien; Müntener, Othmar; Baumgartner, Lukas P.; Putlitz, Benita; Ovtcharova, Maria; Schaltegger, Urs

Earth and Planetary Science Letters, Volume 325-326 , April 2012 , 85-92

ELSEVIER

Content Within Article



Result | Article Info & Abstract | Read-Only Article Viewer | View at Publisher | Permissions

Abstract

Granitic and mafic magma pulses were sequentially accreted in the spectacularly exposed shallow crustal Torres del Paine laccolith, in southern Patagonia. This 12.5Ma pluton forms a composite intrusion with a subvertical feeding system in the west and a laccolith in the east. A key unknown in the formation of sill complexes is how individual magma pulses are assembled over time and the geometry and localization of their feeding system. High resolution zircon CA-ID-TIMS U-Pb dating shows that the laccolith grew first by under-accretion of granitic sills over 90±30ka, linked to a 'sheet-like' feeding system, followed by underplating of mafic sills after ~20ka of quiescence. In the mafic sills complex, individual sills were injected by over-accretion during 41±11ka. Our data show that successive granitic and mafic magmas emplacement generated a volume of ~88km^3 in 162±11ka. © 2012 Elsevier B.V..

Author(s)

Leuthold, Julien ; Müntener, Othmar ; Baumgartner, Lukas P. ; Putlitz, Benita ; Ovtcharova, Maria ; Schaltegger, Urs

Affiliation(s)

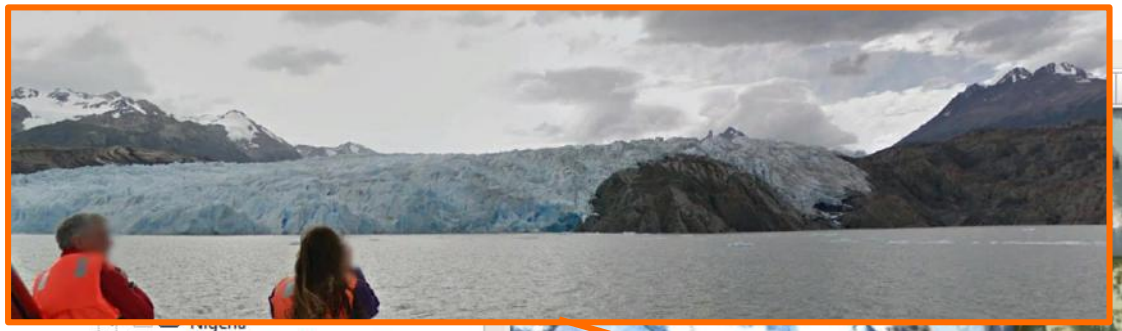
1. University of Geneva, 1205 Geneva, Switzerland
2. University of Lausanne, 1015 Lausanne, Switzerland

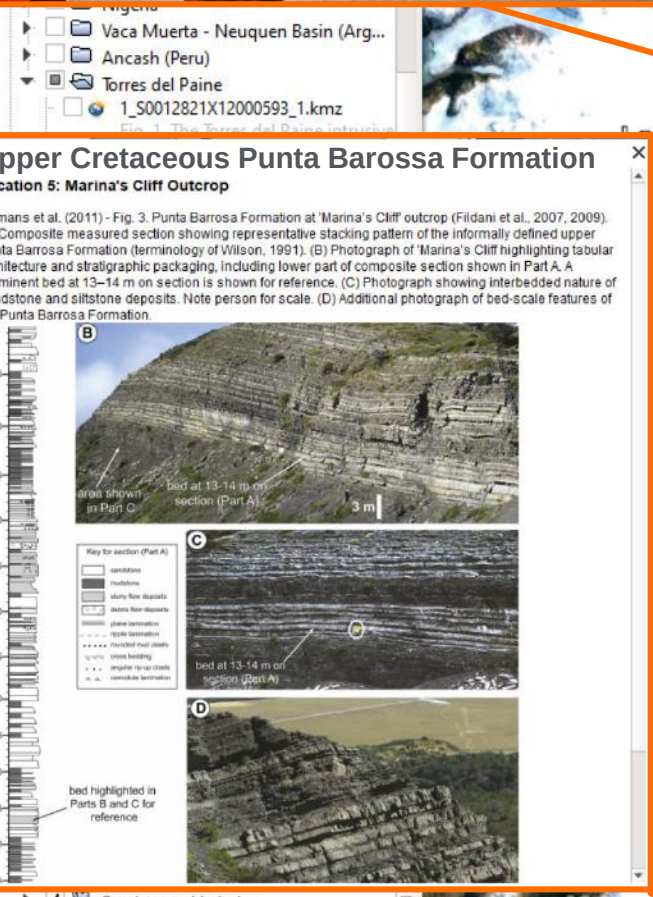
Author Keyword(s)

Laccolith growth; Patagonian Andes; Sill accretion; U-Pb zircon geochronology;

Overview – Torres del Paine Virtual Field Trip

Explore the geology of Torres del Paine

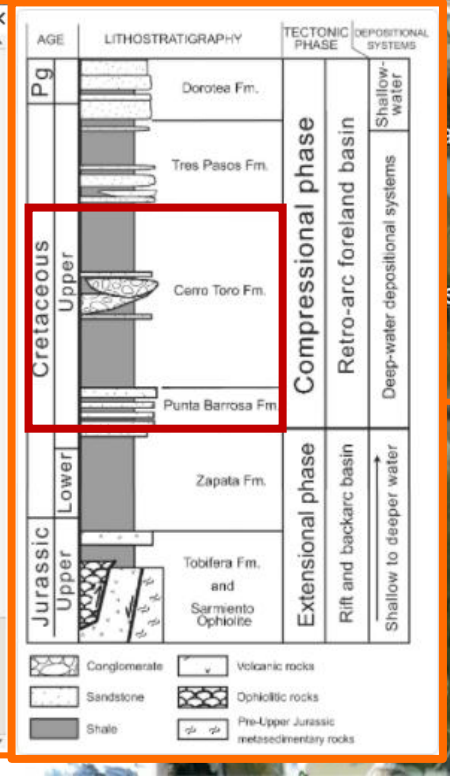




Upper Cretaceous Punta Barossa Formation

Location 5: Marina's Cliff Outcrop

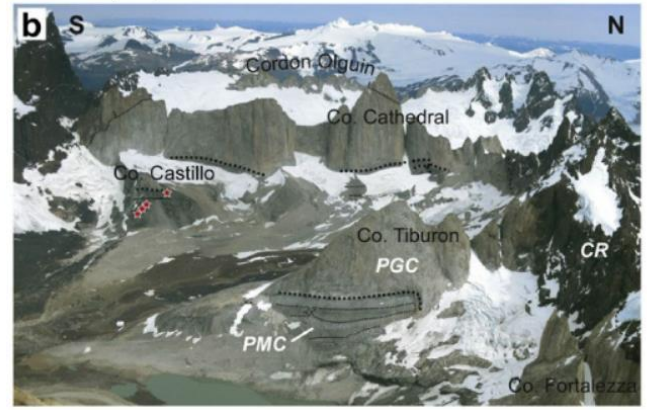
Romans et al. (2011) - Fig. 3. Punta Barrosa Formation at 'Marina's Cliff' outcrop (Fildani et al., 2007, 2009). (A) Composite measured section showing representative stacking pattern of the informally defined upper Punta Barrosa Formation (terminology of Wilson, 1991). (B) Photograph of 'Marina's Cliff highlighting tabular architecture and stratigraphic packaging, including lower part of composite section shown in Part A. A prominent bed at 13–14 m on section is shown for reference. (C) Photograph showing interbedded nature of sandstone and siltstone deposits. Note person for scale. (D) Additional photograph of bed-scale features of the Punta Barrosa Formation.



Torres del Paine Intrusive Complex (Miocene)

Location 2 - Viewpoint to the West

Leuthold et al. (2012)



Link to Geofacets: https://www.geofacets.com/web/pages/content-detail.jsp?request_type=single&content_ids=S0012821X12000593_1¢erPoint=true

Directions: To here - From here

Upper Cretaceous Cerro Toro Formation

Location 4 - Silla Syncline and View on Torres del Paine

Bernhardt et al. (2011) - Fig. 5. Overview of the Silla Syncline looking north towards the Miocene Torres del Paine intrusive complex showing the Pehoe B, Pehoe C, Laguna Negra debris flow deposit, Paine C and the Nordenskold member.

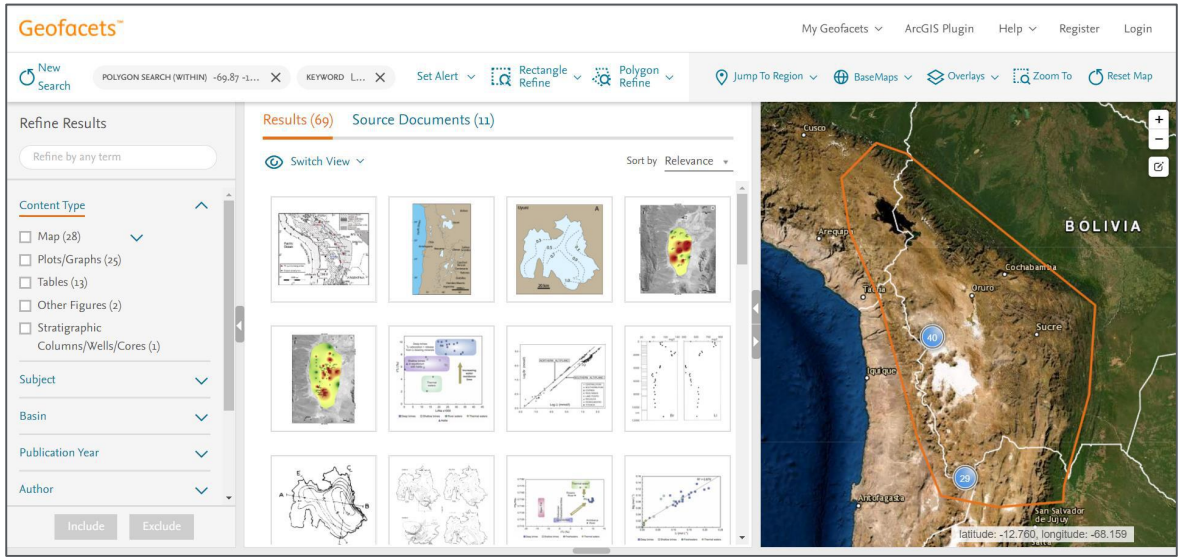
Link to Geofacets: https://www.geofacets.com/web/pages/content-detail.jsp?request_type=single&content_ids=S0264817210001169_fig_5¢erPoint=true

Directions: To here - From here

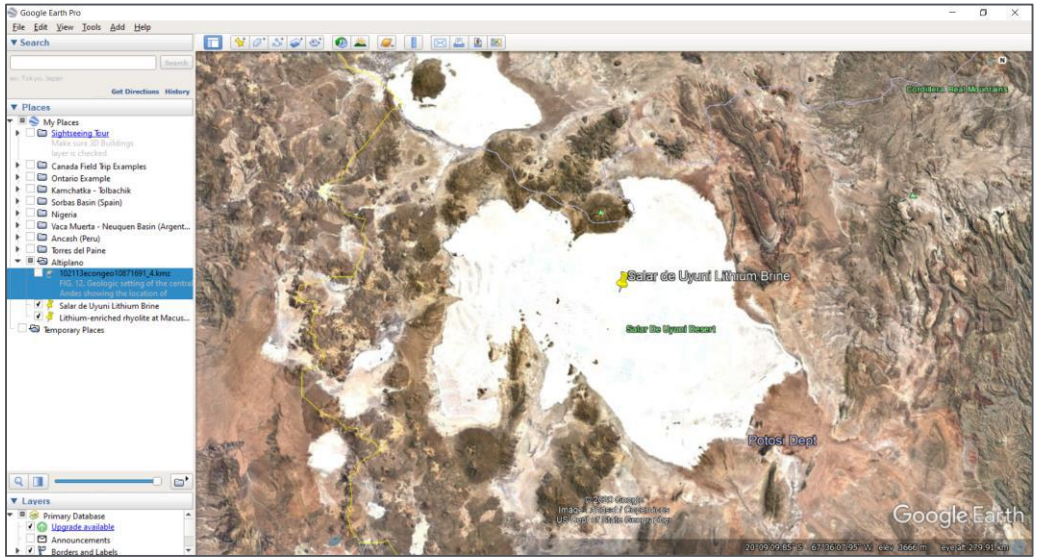
Altiplano (Bolivia, Peru, Chile, Argentina)

Lithium

Geofacets



Google Earth



ELSEVIER

Spatial Search Altiplano / Keyword *Lithium*

Geofacets™

My Geofacets | ArcGIS Plugin | Help | Register | Login

New Search | POLYGON SEARCH (WITHIN) -69.87 -1... | KEYWORD L... | Set Alert | Rectangle Refine | Polygon Refine | Jump To Region | BaseMaps | Overlays | Zoom To | Reset Map

Refine Results

Refine by any term

Content Type

- Map (28)
- Plots/Graphs (25)
- Tables (13)
- Other Figures (2)
- Stratigraphic Columns/Wells/Cores (1)

Subject

Basin

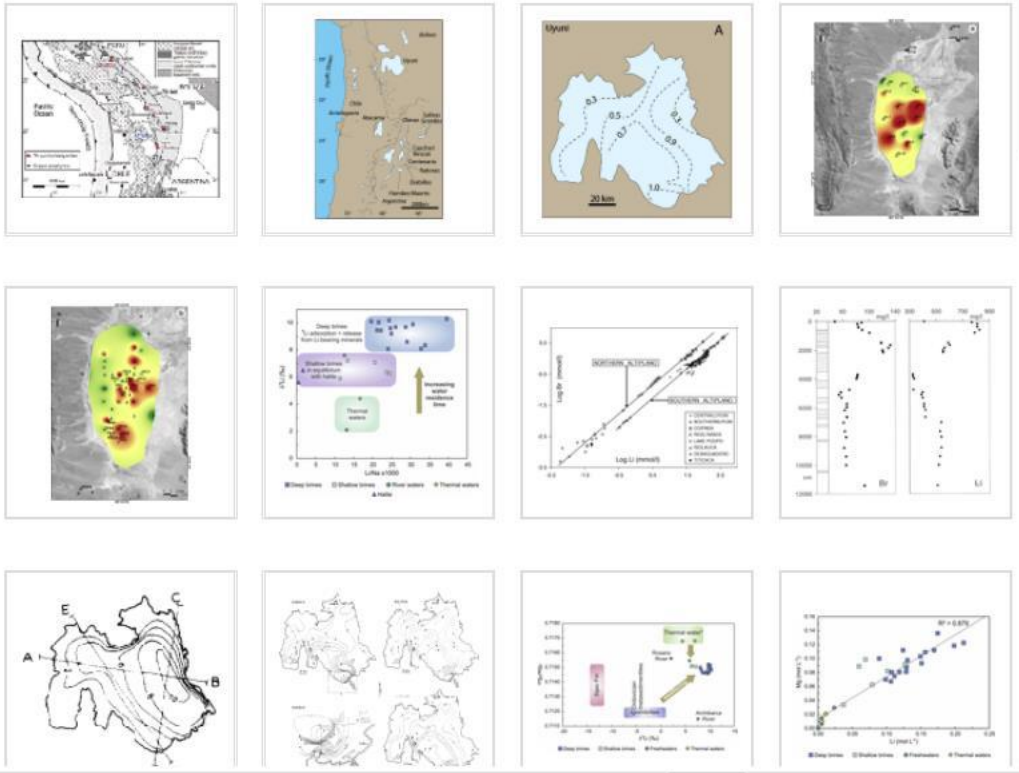
Publication Year

Author

Include | Exclude

Results (69) | Source Documents (11)

Switch View | Sort by Relevance

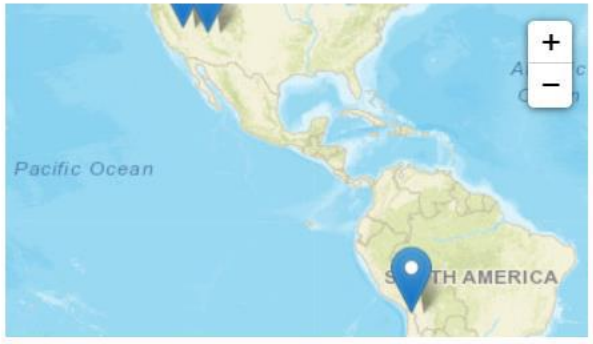


Explore Results – Geological Setting

Geofacets™

My Geofacets | ArcGIS Plugin | Help | Register | Login

Result 1 of 69

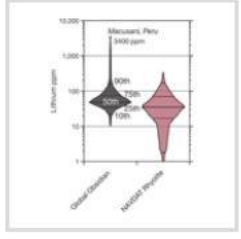


Silicate melt inclusion evidence for extreme pre-eruptive enrichment and post-eruptive depletion of lithium in silicic volcanic rocks of the Western United States: Implications for the origin of Lithium-Rich Brines

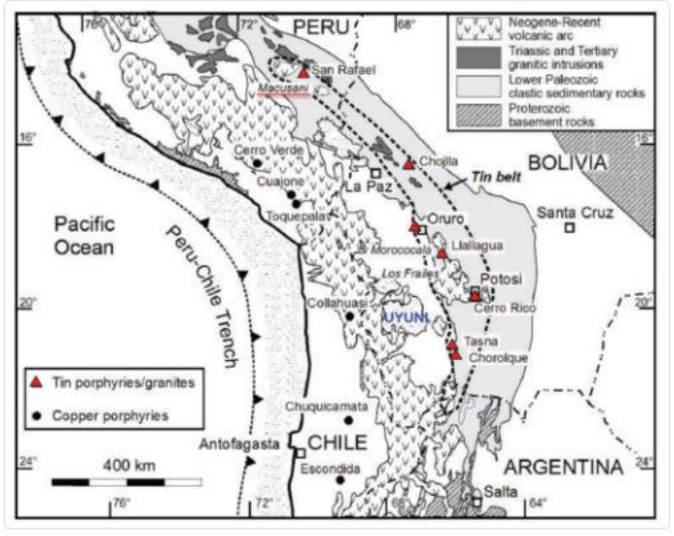
Hofstra, A.H.; Todorov, T.I.; Mercer, C.N.; Adams, D.T.; Marsh, E.E.

Economic Geology, Volume 108, Issue 7 , November 2013 , 1691-1701

Content Within Article



Result | Article Info & Abstract | Read-Only Article Viewer | View at Publisher | Permissions

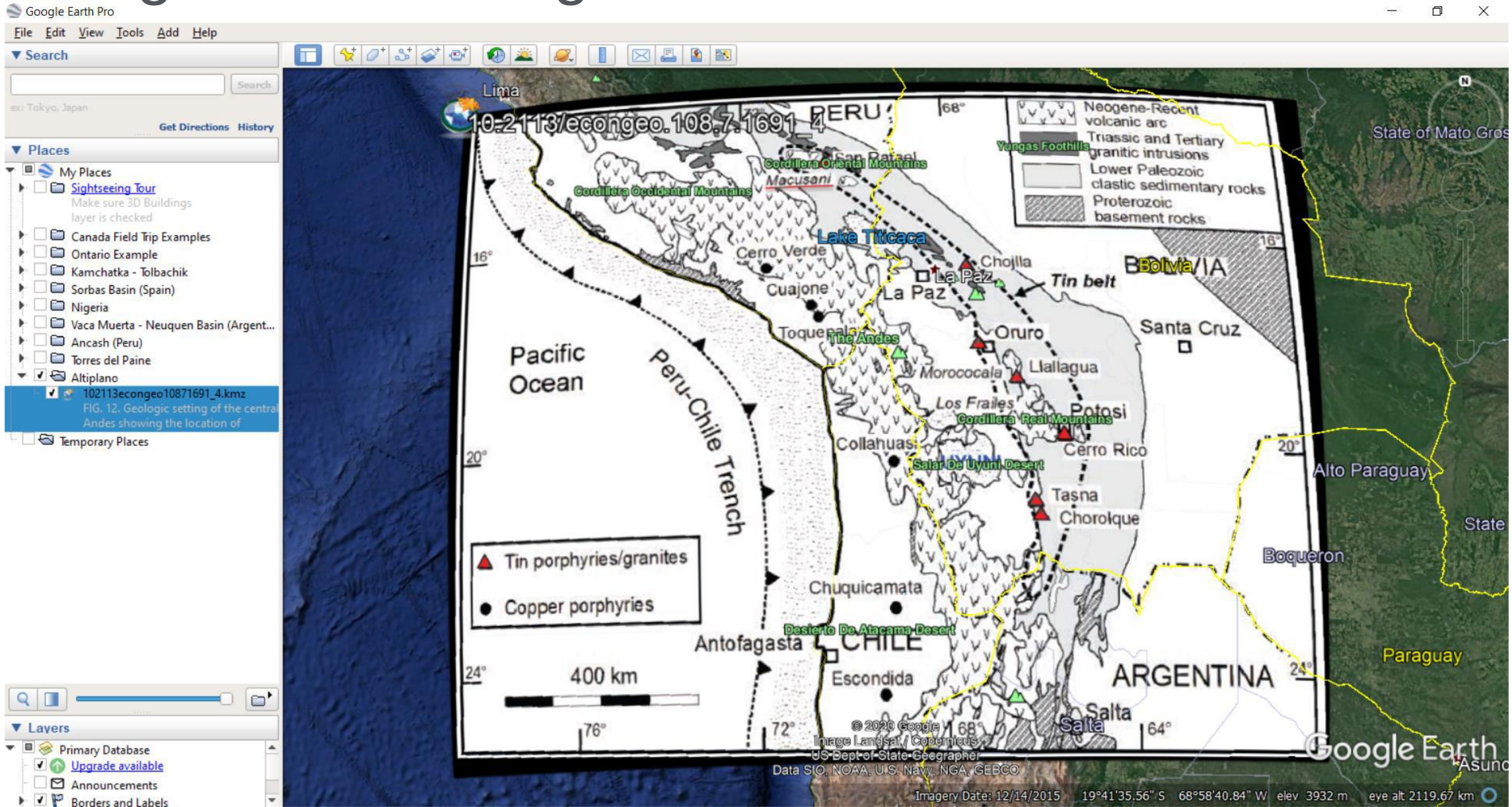


Download

Add to My List

View Original Figure

Integrate into Google Earth



Link to Geofacets for More Information

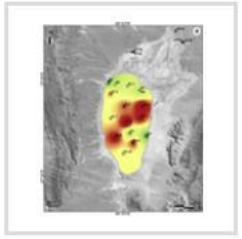
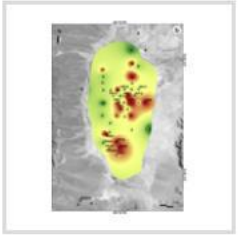
Characterization of lithium cycling in the Salar De Olaroz, Central Andes, using a geochemical and isotopic approach

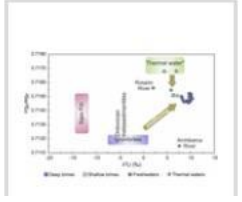
Garcia, M.G.; Borda, L.G.; Godfrey, L.V.; López Steinmetz, R.L.; Losada-Calderon, A.

Chemical Geology, Volume 531 , January 2020

ELSEVIER

Content Within Article

Result | Article Info & Abstract | Read-Only Article Viewer | View at Publisher | Permissions

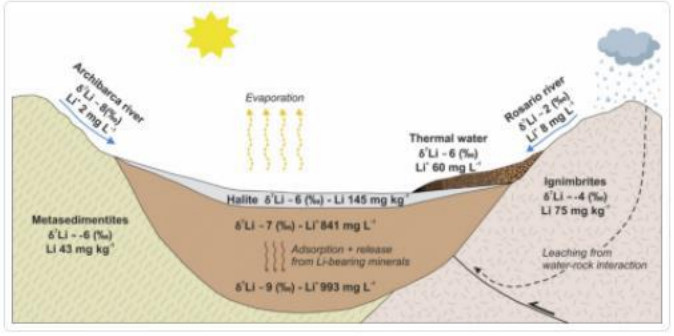


Figure 1. .

Download

Add to My List

View Original Figure

Metadata

Content Type: Other

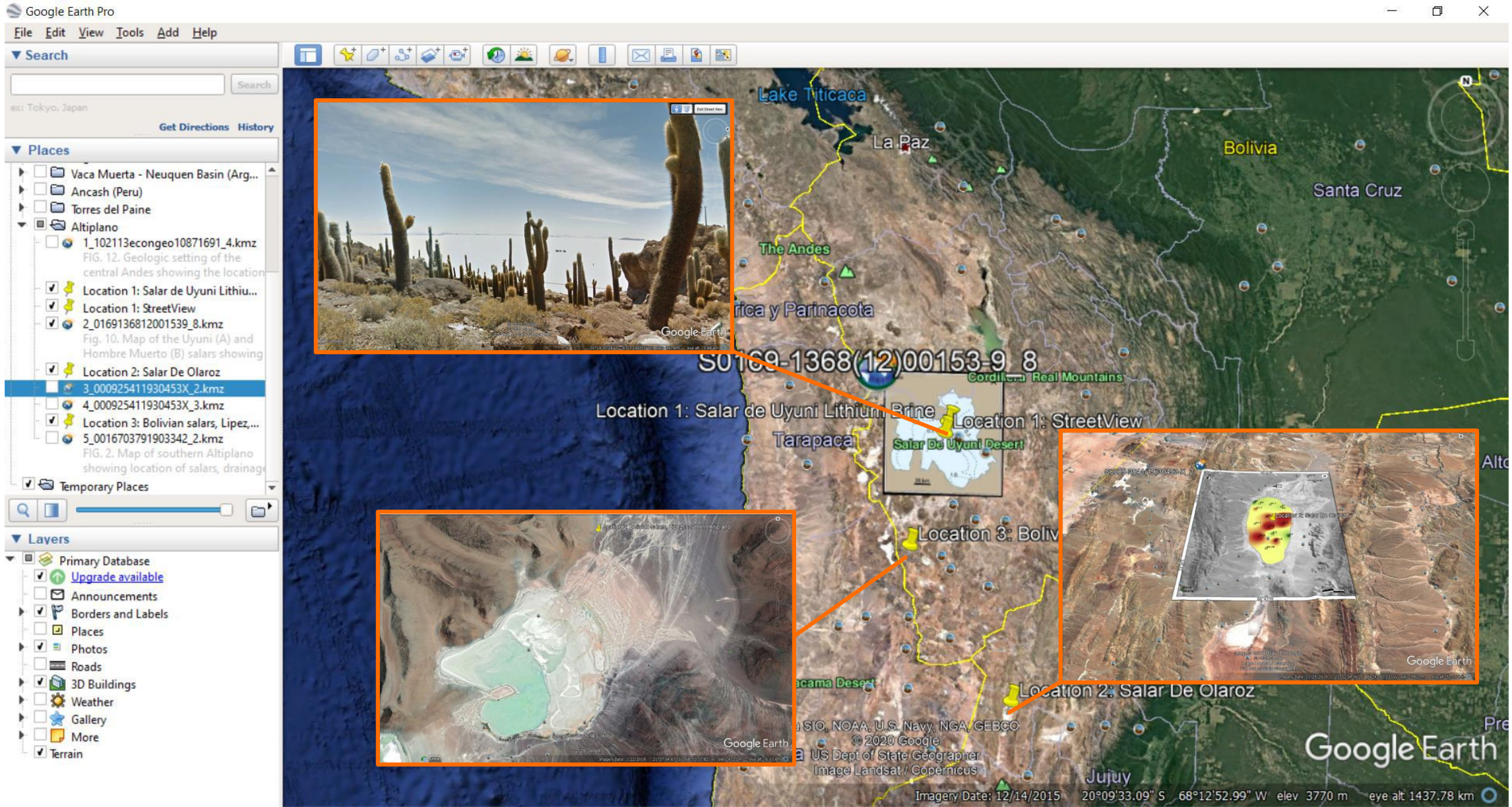
Content ID: S0009-2541(19)30453-X_fig_7

Subjects:
Geology

Bounding Geographic Coordinates:

Overview – Altiplano Virtual Field Trip

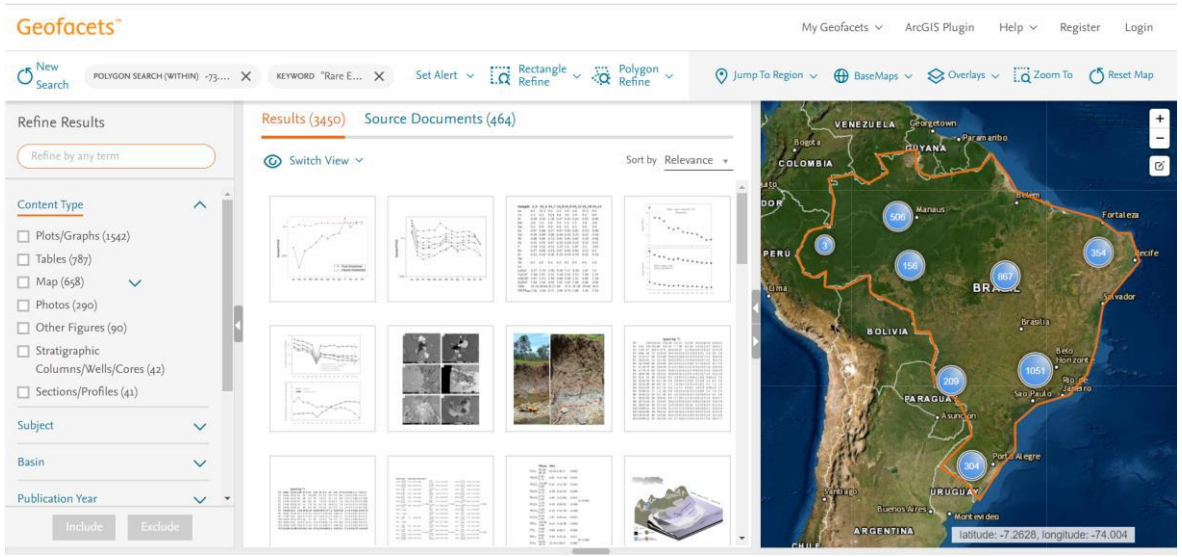
Lithium



Brazil

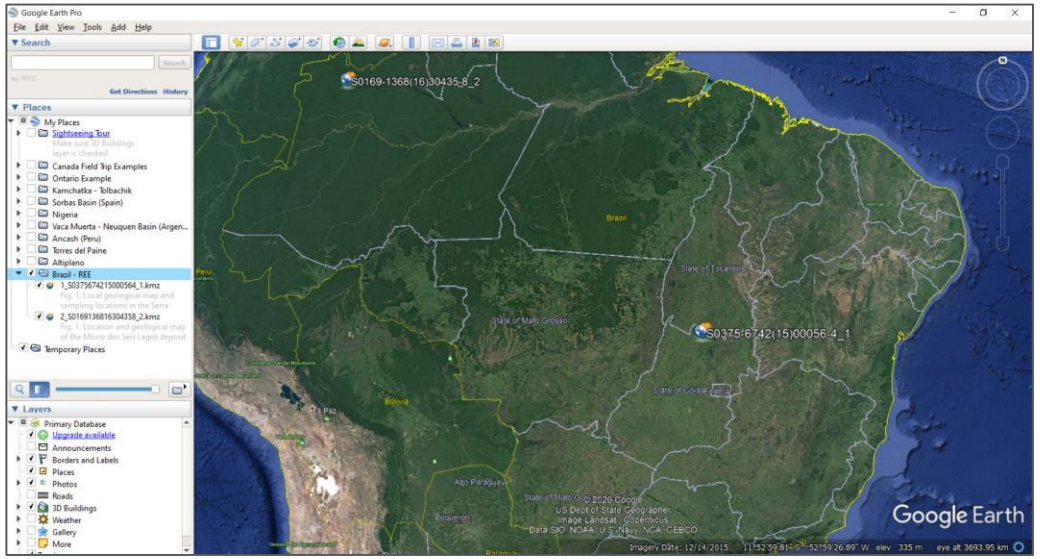
Rare Earth Elements (REE)

Geofacets



+

Google Earth



ELSEVIER

Spatial Search Brazil

Refine by Keyword *“Rare Earth Elements” OR REE*

Refine by Photos

Geofacets™ My Geofacets ArcGIS Plugin Help Register Login

New Search | POLYGON SEARCH (WITHIN) -... | KEYWORD "Rare E... | ... | Set Alert | Rectangle Refine | Polygon Refine | Jump To Region | BaseMaps | Overlays | Zoom To | Reset Map

Refine Results

Refine by any term

Content Type

Subject

Basin

Publication Year

Author

Author Keywords

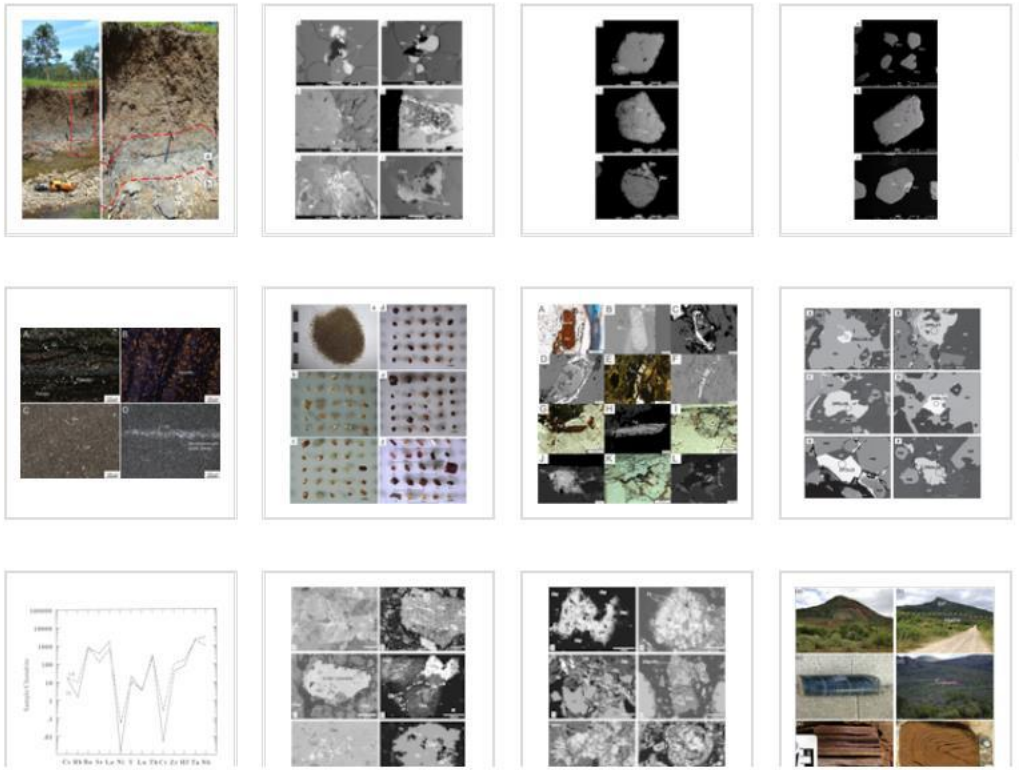
Source Title

Publisher/Content Source

Include Exclude

Results (290) Source Documents (114)

Switch View Sort by Relevance



Explore Results – Outcrop Photo

Geofacets™ My Geofacets ArcGIS Plugin Help Register Login

Result 18 of 290

Mineralogy and geochemistry of laterites from the Morro dos Seis Lagos Nb (Ti, REE) deposit (Amazonas, Brazil)

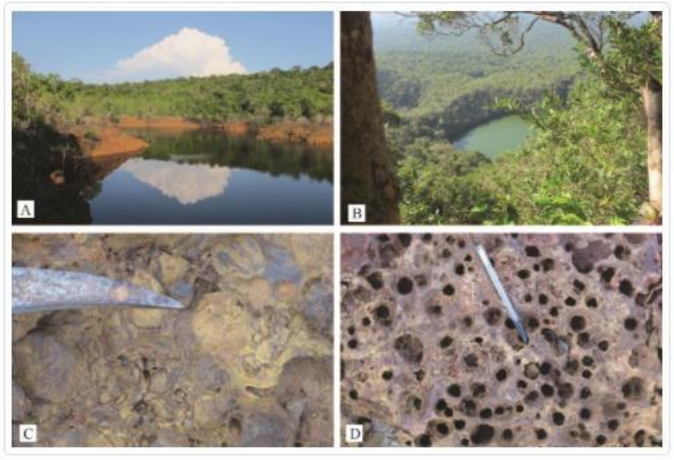
Giovannini, Arthur L.; Bastos Neto, Artur C.; Porto, Claudio G.; Pereira, Vitor P.; Takehara, Lucy; Barbanson, Luc; Bastos, Pedro H.S.

Ore Geology Reviews, Volume 88 , August 2017 , 461-480

ELSEVIER

Content Within Article

Result | Article Info & Abstract | Read-Only Article Viewer | View at Publisher | Permissions



Download

Add to My List

View Original Figure

Fig. 3. (A) Dragon lake (located in Fig.1B) formed in the laterite. (B) Malaquita lake formed in the talus zone, seen from the top of the laterite; on the third plane is observed the plain formed by the basement. (C) Outcroup of laterite with Mn-oxides, near Dragon lake. (D) Laterite with vertical cavities interpreted as ancient pedoturbation, near Dragon lake.

Explore Results – Map

Geofacets™ My Geofacets ArcGIS Plugin Help Register Login

Result 18 of 290

Mineralogy and geochemistry of laterites from the Morro dos Seis Lagos Nb (Ti, REE) deposit (Amazonas, Brazil)

Giovannini, Arthur L.; Bastos Neto, Artur C.; Porto, Claudio G.; Pereira, Vitor P.; Takehara, Lucy; Barbanson, Luc; Bastos, Pedro H.S.

Ore Geology Reviews, Volume 88 , August 2017 , 461-480

ELSEVIER

Content Within Article

Result Article Info & Abstract Read-Only Article Viewer View at Publisher Permissions

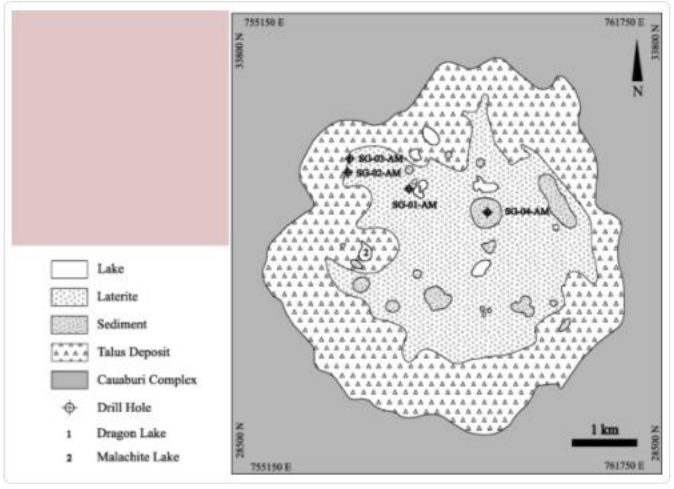


Fig. 1. Location and geological map of the Morro dos Seis Lagos deposit (Viegas Filho and Bonow, 1976).

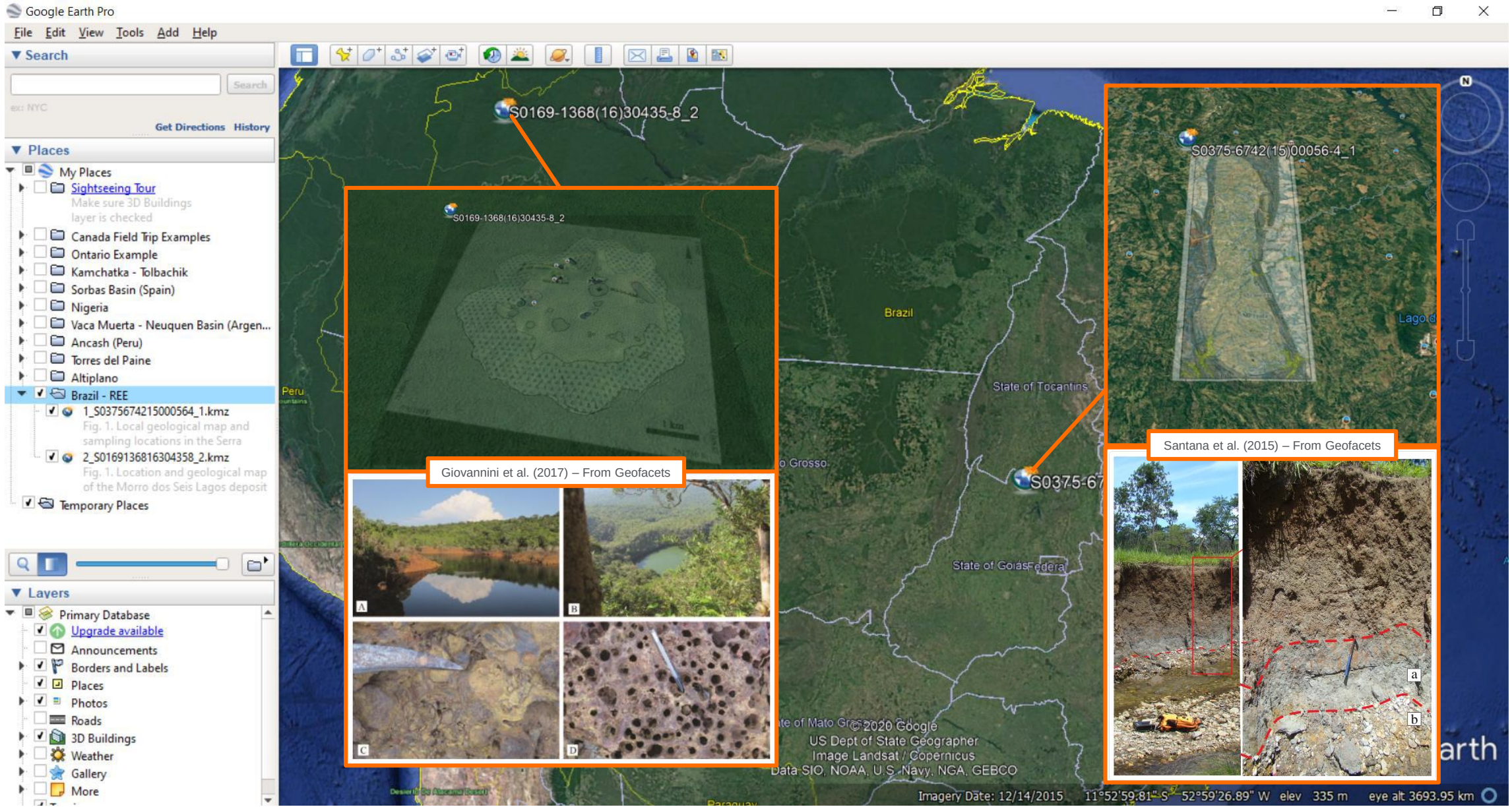
Download

Add to My List

View Original Figure

Overview – Brazil Virtual Field Trip

Rare Earth Elements



DADOS DE CONTATO

Mariela López – 55 (21) 99339-0560
mariela.lopez@elsevier.com

Luiz Baginski - – 55 (21) 99482-6627
l.baginski@elsevier.com

SIGA NOSSAS REDES SOCIAIS:

@laselsevier

@elsevierlas

Elsevier LAS

laselsevier

Elsevier LAS