5TH SERPENTINEDAYS 2024

23 - 25 SEPTEMBER 2024, GRANADA

5th SerpentineDays Workshop

23 - 25 September 2024

Granada, Spain

Abstract volume

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Partners and institutions

We acknowledge the EAG (www.eag.org) for their financial support to cover the registration fees of three awarded international PhD students (Shunya Okino, Japan; Serena Cacciari, Italy; Palash Kumawat, Germany).

Venue

The **5th SerpentineDays meeting** will be hosted at

Carmen de la Victoria, Cta. del Chapiz 9, 18010 Granada, Spain
https://maps.app.goo.gl/1fz3Af1GNERPqnWe6

This unique location in the heart of Granada's historic *Albaicin* district impresses with its traditional architecture and offers a beautiful view on the Alhambra. Most roads and alleys in this neighborhood are narrow, often with stairs. Note that car access is restricted to public transport and residents with permit.

The **conference Dinner** (Wednesday 25th) will take place at

„La Chumbera", Camino Sacromonte 107
https://maps.app.goo.gl/DYWFqP3gR417QdnA9

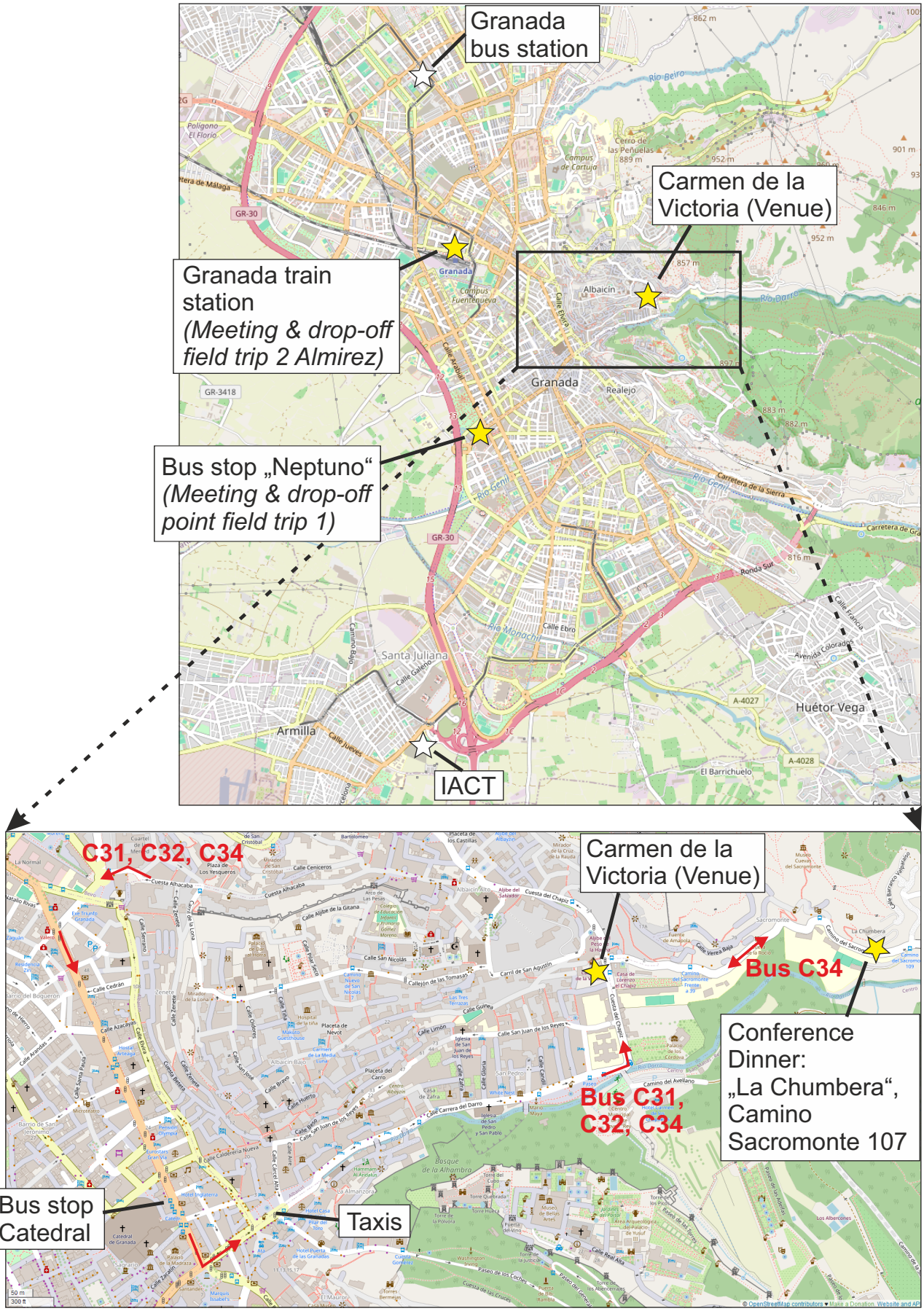
Note that the restaurant is not directly at the main road but a short climb up, either taking a staircase or a small road.

Access

On foot (recommended):
Granada is very well adapted to pedestrians. Reaching the Carmen on foot is the easiest and nicest way, except for persons with restricted mobility (most roads have cobble-stones and stairs). It takes about 20 min to walk from the Cathedral or Plaza Nueva to the Carmen.

By public transport:
Small urban buses connect the center (Cathedral) with the Albaicin: lines C31, C32 and C34. Note that these bus lines are one-way only, making a circle through the district. Tickets can be bought from the driver. More information on urban buses:
https://www.granadadirect.com/transporte/lineas- autobuses-granada/

By taxi:
Taxis (white cars, with green number showing when available;) are affordable (typically around 7 – 15 € from anywhere in Granada). In Albaicin, taxis take the same route as the bus lines.


Granada bus station
Carmen de la Victoria (Venue)
Granada train station (Meeting & drop-off field trip 2 Almirez)
Bus stop „Neptuno“ (Meeting & drop-off point field trip 1)
IACT
C31, C32, C34
Carmen de la Victoria (Venue)
Bus C34
Conference Dinner: „La Chumbera“, Camino Sacromonte 107
Bus C31, C32, C34
Bus stop Catedral
Taxis

Program overview

Sunday 22 September

07:30 - 18:00 Pre-conference fieldtrip 1: Ronda alkaline springs
18:45 - 19:45 Reception & name badges
19:45 - 22:00 Icebreaker (includes buffet and drinks)
Location: Conference venue, Carmen de la Victoria

Monday 23 September

08:30 - 08:45 Registration & name badges
08:50 - 09:00 Welcome
09:00 - 19:00 Scientific program

Tuesday 24 September

09:00 - 19:00 Scientific program

Wednesday 25 September

09:00 - 16:30 Scientific program
16:30 - 17:30 Discussion & outlook
19:45 - open Conference dinner (La Chumbera Restaurant)

Thursday 26 - Friday 27 September

two days Post-conference fieldtrip 2: Almirez massif (Sierra Nevada, Spain)

Conference dinner

On Wednesday 25th of September we will end the 5th SerpentineDays meeting with a conference dinner. This social event will take place at La Chumbera in Sacromonte, the historic caves neighborhood, within walking distance from Carmen de la Victoria.
After dinner, we will enjoy a high-quality flamenco show performed by an award-winning (El Cante de las Minas) Spanish trio consisting of a dancer, guitarist, and singer.

Registration required.

Field trips

Field trip 1: 22 September 2024

We visit the hyperalkaline springs in the Ronda peridotite massif. During this fieldtrip we discuss low-temperature serpentinization and related processes.
max. 26 participants, registration required (fully booked)

Sunday 22, 7:30 Departure by bus from Granada (*Note time change from 8:00 before*).
Sunday 22, 18:00 Return to Granada

The bus has limited space. Please bring only what you need for the trip and leave any larger luggage item in your hotel in Granada. Please bring adequate foot wear (8 km walking) and sun protection, and a picnic in case you cannot have early breakfast in your hotel. Hiking poles may be useful. Lunch at a restaurant, and water and field guides will be provided.

Meeting and drop-off point: Bus stop "Neptuno" (opposite to the commercial center) (https://maps.app.goo.gl/3rcDMMF34XxsBJHu9)
Field trip leaders: Carlos J. Garrido, Manuel D. Menzel

Field trip 2: 26 – 27 September 2024

During two days we visit the Almirez massif (Sierra Nevada, Spain), the world's unique exposure of the high-pressure serpentine dehydration front to prograde harzburgite. This is the perfect place to learn and discuss about the role of serpentinites in subduction zones.
max. 30 participants, registration required (fully booked)

Thursday 26, 8:00	Departure from Granada with cars and Mini-buses
Thursday 26, all day	Field trip first part
Thursday 26, 20:00	Dinner and overnight stay in "Hotel Almirez", Laujar de Andarax
Friday 27, all day	Field trip second part
Friday 27, evening	Return to Granada (train station)

Both days involve hiking in easy/moderate alpine terrain at 2000 – 2500 m altitude. Weather conditions are difficult to predict, it can be very windy and much colder than in Granada. Please bring personal equipment accordingly (mountain foot wear, rain coat, warm clothes / wind-breaker, but also sun protection and hat).
All of the Almirez outcrops are located within the Sierra Nevada National Park. The National Park administration did not grant permission for sampling during this trip.
We have limited space for luggage. Please arrange to deposit larger items in your hotel in Granada if possible; luggage lockers may also be found close to the train station.

Meeting and drop-off point: Granada train station, main square in front (https://maps.app.goo.gl/4nNx4UKQCyNvUzZw7)
Field trip leaders: José Alberto Padrón Navarta, Vicente López Sánchez-Vizcaíno, Carlos J. Garrido, Manuel D. Menzel, Michał Bukała

Scientific program

Sunday, 22 September

19:45 - 22:00 ICEBREAKER (Carmen de la Victoria; buffet + drinks)

Monday, 23 September

8:00 - 8:45 REGISTRATION & NAME BADGES

8:50 - 9:00 WELCOME

Oral 1: Serpentinization at the ocean floor. Chairs: Manuel Menzel; Carlos Garrido

9:00 - 9:15	Baptiste	Debret	Abyssal serpentinite geochemistry and geodynamics
9:15 - 9:30	Coralie	Vesin	Geochemical discrimination of serpentinisation conditions at mid-ocean ridge and continental passive margin
9:30 - 9:45	Muriel	Andreani	Diversity and dynamics of ultramafic-hosted hydrothermal activity at the Rainbow Massif, 36°14'N Mid-Atlantic Ridge.
9:45 - 10:00	Rémi	Coltat	Spatio-temporal variability of mineralized hydrothermal systems in exhumed abyssal serpentinites (Rainbow Massif, 36°N, Mid-Atlantic Ridge)
10:00 - 10:15	Marguerite	Godard	Serpentinization, carbonation and H_2 production at Atlantis Massif (MAR 30°N): Preliminary geochemical results from IODP Expedition 399
10:15 - 10:30	Andrew	McCaig	Macroscopic reaction porosity in the Atlantis Massif: potential for enhanced hydrothermal circulation, fluid access for serpentinisation and the subsurface biosphere

10:30 - 10:45 Flashtalks Posters P1 - P6

P1	Will	Osborne	Tracking Fluid-Rock Interaction Using B Isotopes in Abyssal Serpentinites: Insights from Recent Deep Drilling at the Atlantis Massif (IODP Exp. 399)
P2	Rebecca	Kuehn	Foliation by deformation in low-grade serpentinites from the Atlantis Massif
P3	Lisa	Eberhard	Stress makes it faster: Rapid serpentinization due to deformation-induced permeability increase
P4	Leonardo	Salvadori	Frictional strength, healing behaviour and deformation mechanism of low-grade serpentinites at hydrothermal conditions
P5	Chang	Zhang	Multiple stages of serpentinization identified by boron isotopes of ultramafic rocks from the Xigaze ophiolite, Yarlung-Tsangpo Suture Zone, southern Tibet
P6	Paula	Dörfler	In-situ oxidation of Fe-brucite under hydrothermal conditions: A synchrotron XANES study

10:45 - 11:30 COFFEE BREAK

Oral 2: Serpentinization processes and hydrogen formation. Chairs: Marguerite Godard; Remi Coltat

11:30 - 12:15	Frieder	Klein	KEYNOTE: Reaction Pathways of Serpentinization in Oceanic Settings
12:15 - 12:30	Ruifang	Huang	The influence of fluid compositions on hydrogen (H_2) production during serpentinization
12:30 - 12:45	Benjamin	Malvoisin	New thermodynamic and kinetic constraints on H_2 production during ferroan brucite reaction at low temperature

12:45 - 13:00 Flashtalks Posters P7 - P12

P7	Clément	Herviou	Serpentinization, a key process for the abiotic formation of varied carbonaceous material in the oceanic lithosphere
P8	Lisa	Tagliacollo	Revived interest in historically dismissed Volcanogenic Massive Sulfide (VMS) deposit of the Emilia Romagna region (Italy): Critical Raw Materials (CRMs) petrological and geochemical study
P9	Olivier	Alard	S-C-H relationships in metamorphic serpentines
P10	Yin	Zhuangzhuang	Serpentinization and deserpentinization of the mantle wedge at a convergent plate margin
P11	María	Ramón-Fernández	Hydrogen in orthopyroxene records oxidation during hydration of the cold mantle wedge
P12	Guillaume	Bonnet	Post-peak formation of diopside-bearing calcsilicate rocks within subducted mantle rocks at Cima di Gagnone (Central Alps)

13:00 - 15:00 LUNCH

Oral 3: Serpentinization and life. Chairs: Carlos Garrido & Marguerite Godard

15:00 - 15:45	Barbara	Sherwood Lollar	KEYNOTE: Serpentinization's links to subsurface life constrained by new insights into the Hidden Hydrogeosphere
15:45 - 16:00	Alexis	Templeton	Detecting life-activity within actively serpentinizing peridotite rocks and fluids
16:00 - 16:15	William	Brazelton	Unusual metabolic strategies shared by microbial communities fueled by serpentinization
16:15 - 16:30	Palash	Kumawat	Unraveling Mariana's Microbial Marvels – A Lipidomic Journey into the Serpentinite Biosphere
16:30 - 16:45	Agustín	Solano Arguedas	Biogeochemical cycling of metals in serpentine soils of Costa Rica; linking microbial ecology to the fate of trace elements

17:00 - 19:00 POSTER SESSION I: coffee, drinks and snacks

Tuesday, 24 September

Oral 4: Volatiles and metals during serpentinization and serpentinite alteration. Chairs: Remi Coltat; Lisa Eberhard

9:00 - 9:15	Maureen	Feineman	Sulfur Isotope Variation in Partially Serpentinized Harzburgite from the ~2.05 Ga Layered Mafic Suite of the Molopo Farms Complex, Botswana
9:15 - 9:30	Julien	Fort	Pseudomorphosis and brucite silicification during serpentinization
9:30 - 9:45	Long	Zhang	Formation of kuliginite during serpentinization by saline fluids: reappraisal and new findings
9:45 - 10:00	Katy	Evans	The characteristics and origin of platinum group minerals from Macquarie Island, Australia
10:00 - 10:15	Bastien	Audran	Metals mobility during serpentinization: new insights from the Ronda Massif, Spain
10:15 - 10:30	Thierry	Decrausaz	Mobility of metals during the carbonation of peridotites (Semail Ophiolite, Fanjah, Oman): clues from stable isotopes

10:30 - 10:45 Flashtalks Posters P13 - P18

P13	Guilherme	Ínsua-Pereira	Major and trace element geochemistry of serpentinized ultramafic rocks from the Bragança Complex, NE Portugal
P14	Israel David	Garduño Torres	Structural and geochemical analysis of the Tehuitzingo and Allende serpentinite bodies in Southern Mexico
P15	Tomas	Magna	Serpentinites and serpentinized garnet and spinel peridotites from various lithotectonic units of western margin of the Bohemian Massif – Considerations of mineralogy, geochemistry and non-traditional stable isotope systematics
P16	Takayuki	Nakatani	Experimental study on the formation of spinifex-like textured olivine during antigorite dehydration at 200-700 MPa
P17	Laurie	Besognet	Experimental insight into the abiotic organic synthesis during subduction
P18	Shunya	Okino	Talc formation enhanced by CO_2-metasomatism at crust-mantle boundary in subduction zone

10:45 - 11:30 COFFEE BREAK

Oral 5. CO_2 sequestration and natural hydrogen production. Chairs: Manuel Menzel; Carlos Garrido

11:30 - 12:15	Greg	Dipple	KEYNOTE: Carbon dioxide removal using serpentine-rich mine residues
12:15 - 12:30	Alicja	Lacinska	Serpentinites and ultramafic systems – their role in decarbonisation and resource management
12:30 - 12:45	Eric	Gaucher	Serpentinization, a new proxy for industrial exploration of natural hydrogen

12:45 - 13:00 Flashtalks Posters P19 - P23

P19	Emma	Legros	Serpentine dehydration in subduction zones: characterization of metamorphic olivine veins from the Zermatt ophiolite (Swiss Alps)
P20	Sebastian	Stumpf	Antigorite dehydration fluid element concentrations and fluid/mineral element distribution coefficients
P21	Julia	Dietrich	Ferric iron systematics of hydrated metaperidotites beyond antigorite dehydration
P22	Luis Samuel	Cristóbal Díaz	Unravelling the Redox Conditions during Deserpentinization through Sulphide Mineral Assemblages
P23	Serena	Cacciari	Fluid-rock interaction in eclogite-facies meta-peridotite (Erro-Tobbio, Ligurian Alps)

13:00 - 15:00 LUNCH

Oral 6: Physics of serpentinization, deformation and dehydration. Chairs: Lisa Eberhard; Jose Alberto Padrón Navarta

15:00 - 15:15	Javier	García-Pintado	Tectonics, Hydrothermal Circulation and Serpentinization in Magma-poor Rifting and start of Oceanic Spreading
15:15 - 15:30	Jeremy	Deans	Petrophysical properties of a 1.2 km section of the Atlantis Massif oceanic core complex: IODP Expedition 399
15:30 - 15:45	Wolf-Achim	Kahl	Low-temperature alteration of ultramafic seafloor: Imaging reaction-induced porosity as precursor for microbial habitat development and carbonation
15:45 - 16:00	Juan Carlos	de Obeso	Geochemistry and petrology of the Vizcaino Ophiolite serpentinites
16:00 - 16:15	Manuel	Menzel	Changing deformation style during serpentinite carbonation to talc-magnesite and quartz-magnesite along a plate-scale fault zone
16:15 - 16:30	Jesús	Muñoz	Fluid-Driven Shear Instabilities in the Subducted Oceanic Mantle at Intermediate Depths: Insights from Western Alps meta-ophiolites
16:30 - 16:45	Austin	Arias	Pre-encoded Permeability: An evaluation of the fluid flow properties and growth drivers of serpentinite dehydration vein networks
16:45 - 17:00	Timm	John	Pulsed fluid release from subducting slabs caused by a scale-invariant dehydration process

17:00 - 19:00 POSTER SESSION II: coffee, drinks and snacks

18:30 - 19:00 Organization meeting Future SerpentineDays

Wednesday, 25 September

Oral 7: Fluid-rock interactions in (meta)serpentinites at the subduction interface. Chairs: Jose Alberto Padrón Navarta; Manuel Menzel

9:00 - 9:45	Atsushi	Okamoto	KEYNOTE: Dynamic interplay of fluid-rock reactions, mass transport and fracturing at shallow mantle wedge
9:45 - 10:00	Vicente	López Sánchez-Vizcaíno	High-pressure metasomatism and carbonation of metaserpentinites during deformation at the subduction interface
10:00 - 10:15	Samuel	Angiboust	Deciphering fluid-rock interaction events in fractured mantle wedge jadeitites
10:15 - 10:30	Clothilde	Minnaert	Omphacitite formation and deep fluid-rock interaction processes in an intra-slab serpentinite-bearing shear zone
10:30 - 10:45	Kevin	Wong	Numerical modelling of dynamic fluid-rock reactions in subduction settings
10:45 - 11:30	COFFEE BREAK		

Oral 8: High-pressure (de)serpentinization and redox processes. Chairs: Vicente López Sánchez-Vizcaíno; Lisa Eberhard

11:30 - 11:45	Alberto	Vitale Brovarone	The deepest roots of serpentinization: implications on deep energy, geophysics, and deep life at convergent plate margins
11:45 - 12:00	Isabelle	Daniel	Serpentine triggers the formation of Condensed Carbon Matter
12:00 - 12:15	Orlando Sébastien	Olivieri	Production and migration of metamorphic CH_4 driven by fluid infiltration and serpentinization of subducted ultramafic/mafic rocks
12:15 - 12:30	José Alberto	Padrón-Navarta	Redox-modulated deserpentinization in subduction zones
12:30 - 12:45	Michał	Bukała	Metaserpentinites sequester sediment-derived methane and CO_2 in subduction zones via redox-driven carbonate precipitation
12:45 - 13:00	Thomas	Pettke	Sulphide geochemistry and sulfur isotope systematics of subducted hydrous ultramafic rocks from Cerro del Almirez, Spain
13:00 - 15:00	LUNCH		

Oral 9: Serpentinite dehydration and consequences for geochemical cycling. Chairs: Carlos Garrido; Marguerite Godard

15:00 - 15:15	Yi-Xiang	Chen	The role of serpentinite in crust-mantle interaction and arc magma formation
15:15 - 15:30	Jo Hannah	Asetre	Fluid mobile elements and volatile behaviour during serpentinite dehydration
15:30 - 15:45	Michelle	Ulrich	Serpentine dehydration in the subducted lithosphere produces no B isotopic fractionation
15:45 - 16:00	Enrico	Cannaò	Variable δ11B signatures reflect dynamic evolution of the Mariana serpentinite forearc
16:00 - 16:15	Francesco	Ressico	Coupling bulk and in-situ boron isotopes from a subduction related serpentinization front (Monte Maggiore, Alpine Corsica)
16:15 - 16:30	Ivan	Savov	Storage and fate of volatiles in the shallow mantle: Insights from fluid mobile elements and B and Li isotopes in serpentinites
16:30 - 17:30	DISCUSSION & OUTLOOK		
19:45	CONFERENCE DINNER (La Chumbera Restaurant)		

Serpentinites and ultramafic systems – their role in decarbonisation and resource management

Lacinska, Alicja[1]

[1] *British Geological Survey. Decarbonisation and Resource Management*

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Ultramafic systems, including partially serpentinised peridotites, serpentinites and nickel laterites exhibit geochemical properties that are important for decarbonisation technologies. As the primary source of nickel globally (sulphide or oxide/silicate ore), these rocks have been mined and processed on a large scale for nearly two centuries now [1]. The use of nickel in rechargeable batteries for electric vehicles drives the global demand for nickel, providing further incentive for the expansion of mining and processing of primary ores. However, those industrial operations can adversely affect the environment, for example through the release of CO_2 and potentially hazardous elements (PHE), such as hexavalent chromium, or minerals, e.g. chrysotile asbestos. Through our better understanding of the social and environmental impacts of mining operations and the availability of technologies that can potentially mitigate adverse impact, it is paramount to aim for more responsible mining and metal recovery operations globally.

At the British Geological Survey, we focus on full system, multi-scale understanding of ore to provide insights into the potential of improved ore utilisation (maximum metal output and minimum waste). To that extent, we investigate the metallogenic models for the concentration of metals in serpentinites and the overlain laterites, focusing on the metal deportment across the deposit's profile or the role of manganese oxides in the concentration of nickel and cobalt, more specifically. Secondly, we explore the potential of ultramafic systems (including serpentinites and laterites) to sequester CO_2 through the formation of carbonate minerals (mineral carbonation) [2 - 5], and the potential of carbonates to crystallographically immobilise chromium alongside the CO_2 [6].

Ultramafic systems offer a plethora of natural resources needed for transition to greener technologies, including metals used in rechargeable batteries or fuel cells (Ni, Co, PGE), metals needed for CO_2 sequestration (Mg, Fe) or indeed natural hydrogen. It must be stressed that these rocks also contain minerals that can pose serious health risks to the communities around mining and ore processing operations, and that this resource must be understood thoroughly and managed carefully.

References:

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[4] Styles, M. T., et al. (2014). Greenhouse gases science and technology 4. https://doi.org:DOI:10.1002/ghg
[5] Lacinska, A., et al. (2024). UK Government, the Department of Energy Security and Net Zero.
[6] Lacinska, A. M., et al. (2024). Mineralogical Magazine 1-8. https://doi.org:doi:10.1180/mgm.2023.91

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