

An early stage researcher PhD position (ESR#10) is available at the University of Geneva as part of the Marie Curie Innovative Training Network “S2S-FUTURE”

Chemical weathering response to extreme global warming during Paleocene Eocene Hyperthermals, Southern Pyrenees, Spain

ORGANISATION/COMPANY	University of Geneva (UNIGE)	TYPE OF CONTRACT	<i>Temporary</i>
RESEARCH FIELD	Earth and Environmental Science	JOB STATUS	<i>Full-time</i>
RESEARCHER PROFILE	<i>First Stage Researcher (R1)</i>	HOURS PER WEEK	40
APPLICATION DEADLINE	<i>1/03/2020 23:59 - Europe/Brussels or until position is filled.</i>	OFFER STARTING DATE	<i>As of 01/08/2020</i>
LOCATION	Switzerland › GENEVA	EU RESEARCH FRAMEWORK PROGRAMME	<i>H2020 / Marie Skłodowska-Curie Actions</i>

Host institution

The section of Earth and Environmental Science (SEES) at the University of Geneva, is a premier swiss center for the Geosciences, with strong links with leading research institutions across Europe and partnerships with industrial, governmental and non-governmental bodies. Research at SEES covers the broad range of the Earth Sciences and Environment with an interdisciplinary approach to three priority directions in line with sustainable development goals: 1) global changes, 2) natural resources and geoenvironments, and 3) natural and anthropogenic risks. SEES core competences in fundamental earth sciences are in the fields of sedimentary geology, magmatic and volcanic geology, and geochemistry. SEES works with 55 academics, including 20 professors, and further 35 post-docs and 95 PhD students, raising an average of 10M€ of external funding every year. SEES benefits of a wide set of state-of-the-art equipment operated by technical staff, and flagship facilities for dating and tracing geological processes. The Earth Surface Dynamics group (ESD) of Sebastien Castellort is internationally reputed for its expertise in source-to-sink analyses of sedimentary systems. The ESD has pioneered research on the interactions between solid and fluid earth processes through some of the first recognitions and quantifications of the links between surface processes and magmatism. Several projects funded by the Swiss National Science Foundation and Energy companies (TOTAL, EQUINOR) center on ancient S2S systems in the Pyrenees, the Mediterranean and Gulf of Mexico, with emphasis on sedimentary proxies of paleoclimates and extreme events.

Research objectives

Exceptional preservation of entire source-to-sink systems in the Southern Pyrenean Foreland basin during Paleocene and Early Eocene provides a unique opportunity to apply novel geochemical tools for **quantifying the chemical weathering evolution along the sediment routing system** and over a period of time characterized by multiple hyperthermal events (e.g., PETM, ETM2, ETM3). It was recently shown that ϵ_{Nd} and ϵ_{Hf} decoupling in the detrital clay fraction of sediments ($\Delta\epsilon_{Hf}$), reflects variations in chemical weathering intensity of the continent. Variations in physical erosion and chemical weathering, tectonically or climatically driven, are also reflected by the nature and relative proportion of clay minerals. We will use an approach combining clay mineralogical analyses with clay Hf and Nd isotope analyses ($\Delta\epsilon_{Hf}$) on samples distributed along the entire S2S from proximal alluvial plains to basin floor fans, and distributed stratigraphically from the PETM to ETM3, hyperthermals and inter-hyperthermals included. These results will be a natural benchmark for chemical weathering models developed in related project ESR15.

Presentation of the research project (cooperative aspect)

This PhD position is within the framework of a European ITN project named **S2S-FUTURE: SIGNAL PROPAGATION IN SOURCE TO SINK SYSTEMS for the FUTure of earth Resources and Energies** involving **15 PhD positions**.

Under the supervision of Sébastien Castelltort (Professor, University of Geneva, Earth Surface Dynamics) and Emmanuelle Pucéat (Associate Professor, University of Dijon), the PhD student will provide unique constraints on the response of an entire source-to-sink system to climate perturbations. Specifically, the PhD will result in (1) a first estimation of chemical weathering perturbation due to extreme global climate perturbation, (2) constraints on the response timescale of chemical weathering to rapid climate change, (3) generic predictions for global climate impact on continental fluxes of solutes. These data will further our understanding of sedimentary systems response to extreme perturbations (ITN Work Package "RAPID"). The project involves field work in the Pyrenees and collaborations with multiple European institutions and industrial partners, including research stays (secondment) at **University of Dijon** (Ass. Prof. Emmanuelle Pucéat; 8 months) for Nd and Hf isotope analyses, and **GFZ-Potsdam** (Prof. Jean Braun, 1 months).

The PhD student will be also involved in scientific/soft-skills meetings and in research activities conducted in other laboratories/companies from Europe and associated countries.

An important component of the training will be the participation to 3 main major "Summer Institutes":

Summer 2020: "Dragonstone" – South-Pyrenees Spain and France: an innovative combination of field excursion and computer modeling of surface processes from source to sink.

Summer 2021: "The Factory" – Norway, Great Britain and Switzerland: field visit of modern S2S systems and course intensive program program of technical and soft skills to accelerate the students' research, write and present their results, consolidate their profiles and develop concrete plans for their future.

Summer 2022: "Inside Africa" – South-Africa: an immersion of ESRs in the modern source-to-sink system of a continental-scale large river, the Orange in Southern Africa, with high economic implications for mining industries.

In addition to these major milestones of the program, the PhD students will 1) continuously develop their **core research skills via their own research project** locally and within the network while at secondments and conferences, 2) receive a mandatory amount of **hard and soft-skills training** specific to their own doctoral school, along with mentoring by joint supervising bodies, 3) use **EGU conferences both as dissemination events for ESRs results and network events for progress reports and evaluations**, and 4) **collaborate into practical activities aimed at network-structuring legacy deliverables**.

The goal of S2S-FUTURE is to **understand, quantify and model the sediment routing system from the sediment production (source) to the sediment deposition (sink); its tectonic and climatic controls; and to establish generic rules for a full understanding of signals propagation in S2S systems** for building predictive models of sediment location and characteristics. These studies of S2S systems require **interdisciplinary approaches** combining geomorphology, sedimentology and stratigraphy, geochemistry, tectonic and paleoclimatology coupling observations, quantifications and process modelling. All these skills are integrated in the S2S-FUTURE project.

The objectives of S2S-FUTURE have been designed with primary societal implications in the domains of **water, carbon-derived energy, sustainable geological energy and geological storage of non-geological energy, waste geological storage, mineral resources, and building materials**. These points have become crucial for sustainable investment and development according to several of the United Nations Sustainable Development Goals such as **SDG#6 (Clean water and sanitation)**, **SDG#7 (Affordable and clean energy)** and **SDG#13 (Climate action)** among others.

Benefits

With *indicative* financial conditions of the research project (in local currency)

- 3-years full-time employment contract
- Attractive salary tuned to living standards of the hosting country. CH minimum net salary before income taxes of CHF3166 per month. NB: this net salary results from deducting all compulsory (employer/employee) social security contributions but not direct taxes (e.g. income tax, health insurance).
- Conditional family allowance of CHF593 per month (potentially subject to taxes)
- Net mobility allowance of CHF494 per month (potentially subject to taxes)
- Based in the vibrant Department of Earth Sciences of University of Geneva, one of the most advanced Earth Science Department in Europe (<https://www.unige.ch/sciences/terre/en/earth-sciences-department/>). Staff in Geneva have excellent working conditions.
- Be part of a large and enthusiastic international team, where own initiatives and ideas are encouraged, with the opportunity to sculpting the future of Source-to-Sink research and network in Europe
- Possibility to collaborate with a large network of international research groups engaged in the ITN

Requirements

- The candidate should be in the first four years of their research career. They should not have a doctoral degree and fulfil the eligibility criteria and mobility rule (see below)
- The candidate should hold or be about to obtain a Master's degree in Earth Science or relevant field.
- Disciplinary knowledge in geochemistry, sedimentary geology, statistics.

- Previous experience working with clastic fluvial and marine sediments, including sequence stratigraphy will be an advantage.
- Experience in laboratory work is required, with an ability to be very rigorous, to understand and apply relatively complex protocols involving manipulation of concentrated acids.
- Previous experience in clean room work would be appreciated, along with an experience in radiogenic isotope analyses.
- The ability to work both as part of a team, and independently, coupled with excellent communication, organizational and problem-solving skills
- Availability to travel for training events and research secondments.

ELIGIBILITY CRITERIA

Recruiting is in accordance with the European rules for Marie Curie Initial Training Networks. Early-stage researchers (ESR) can be of any nationality. They must be, at the time of recruitment by the host organization, in the first four years (full-time equivalent) of their research careers and have not yet been awarded a doctoral degree. The research career starts after the degree that enables a student to proceed with a PhD (usually, the Master degree).

MOBILITY RULE

At the time of the recruitment by the first host institution, the ESRs must not have resided or carried out their main activity (work, studies, etc.) in the country of their first host institution for more than 12 months in the 3 years immediately before the recruitment date. Short stays such as holidays and/or compulsory national service are not taken into account.

How to apply

Send your complete application before 1st of March to both contacts below (application will remain open until position is filled).

A **single pdf file** needs to be submitted including:

- a cover letter, stating your research motivation and interests; including relevant background and career plan (max 1 A4 page)
- a Curriculum Vitae, including academic background, previous research and/or industrial experience (max 2 A4 pages)
- Degree transcripts (with marks)
- English language qualification certificates (or equivalent)

Reference letters:

- at least 2 confidential reference letters from academics (including name, position and email address of the referee) (max 1 A4 page, with substantiated assessment of the applicant's technical skills, creativity, innovation ability, working capacity, efficiency and level of independence) must be sent directly to the contacts below.

Contacts:

ESR Supervisor: sebastien.castelltort@unige.ch

Recruitment Board: François.Guillocheau@univ-rennes1.fr

Project website: <https://cordis.europa.eu/project/rcn/224709/factsheet/en>

Research group website: <https://sites.google.com/view/earthsurfacedynamics/home>