

CarboNetwork

All the news and opportunities from the Italian scientific community working on the Carbon Cycle

February 2021



L'immagine simbolo del workshop "Terra, vita e clima: il ciclo del carbonio" organizzato nel novembre 2018

Tutte le opportunità e le news dedicate alla comunità scientifica del ciclo del carbonio

Istituito nel febbraio 2019 dal Dipartimento Scienze del Sistema Terra e Tecnologie per l'Ambiente del CNR, il gruppo di lavoro "**Ciclo del Carbonio**" è costituito da 11 ricercatori e ricercatrici provenienti da numerosi istituti del CNR, università e altri enti di ricerca. La costituzione del gruppo parte dal workshop "**Terra, vita e clima: Il ciclo del Carbonio**", primo incontro di discussione scientifica nella comunità italiana impegnata sul ciclo del Carbonio, organizzato a novembre 2018 presso l'Area di Ricerca del CNR di Pisa.

Perché un network dedicato al Ciclo del Carbonio

Il carbonio è uno degli elementi più abbondanti nell'universo e forma un numero elevatissimo di composti inorganici ed organici che si trasformano costantemente attraverso il metabolismo degli organismi e i processi chimici naturali. I *reservoir* più imporranti di carbonio sono litosfera e mantello, che contengono circa cento milioni di GtC, di cui 4,000 sotto forma di combustibili fossili, gli oceani con circa 40,000 GtC, il suolo e la vegetazione con 2,200 GtC e in ultimo l'atmosfera con circa 750 GtC, circa 180 GtC in più rispetto all'epoca pre-industriale. Gli scambi di carbonio tra questi *reservoir* sono caratterizzati da **interazioni** chimiche, fisiche e biologiche secondo processi che variano nel tempo e nello spazio. Moltissime sono le domande ancora aperte e le **incertezze** sulle quali siamo chiamati a rispondere:

- Quali sono i flussi geologici del carbonio - degassamento e sequestro - e come sono variati nel tempo?

- Quale è il ruolo del metano e quale il suo contributo nel ciclo del carbonio, con particolare riferimento alle aree umide e al permafrost?
- Quali sono i feedback provenienti dalle reti trofiche, sia acquatiche che terrestri, e come modificano i flussi di C?
- Quali sono le interazioni tra la sostanza organica disciolta in mare e le comunità microbiche e quali le conseguenze sul ciclo del carbonio?
- Quali sono le interazioni tra le varie sfere del sistema terra, come si sono modificate nel passato e come si stanno modificando oggi?
- Quali sono le principali incertezze nella quantificazione delle componenti antropiche sul ciclo del carbonio e come possono essere ridotte?

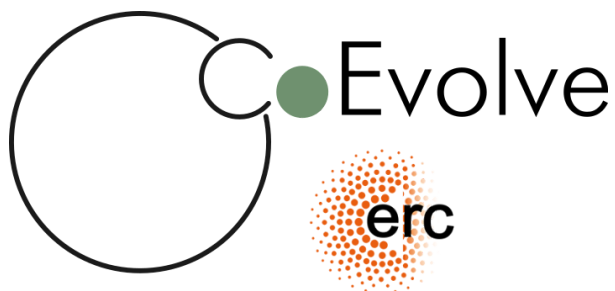
Il crescente ed inarrestabile aumento di carbonio fossile in atmosfera ad opera delle attività umane è una delle principali cause del riscaldamento globale; vari processi di retroazione e amplificazione potrebbero aumentarne ulteriormente la concentrazione, in primis attraverso la drammatica fusione del Permafrost. E' quindi di cruciale importanza discutere le migliori strategie di azione, che vanno da una gestione multifunzionale delle foreste, alla protezione degli ecosistemi marini e terrestri fino allo sviluppo di tecnologie a emissioni negative, che possano contribuire a **mitigare** gli effetti del cambiamento climatico.

Obiettivi del Gruppo “Ciclo del carbonio”

- Coinvolgere la comunità scientifica impegnata nei molteplici aspetti della ricerca sul ciclo del carbonio, per creare un network transdisciplinare
- Contribuire a definire tematiche di ricerca comuni sul ciclo del carbonio, focalizzandosi sulle interazioni chimiche, fisiche e biologiche che regolano gli scambi tra le sfere
- Individuare e segnalare possibili opportunità di finanziamento e bandi di progetto in ambito nazionale e internazionale
- Supportare la comunità scientifica che studia il ciclo del carbonio, comunicando periodicamente iniziative ed eventi, aggiornamenti sulla letteratura scientifica, opportunità di partecipazione a progetti e bandi attivi attraverso la Newsletter dedicata “CarboNetwork”
- Organizzare incontri scientifici, eventi di disseminazione e formazione (workshop, scuole estive, seminari)

Per iscriversi alla newsletter é possibile seguire [questo link](#). Se invece non desiderate ricevere più la newsletter del carbonio potete seguire [questo link](#).

Cofounder of the CarboNetwork wins a ERC Starting Grant



Donato Giovannelli, assistant professor in microbiology at the University of Naples Federico II and cofounder of the CarboNetwork, has been recently awarded a **ERC Starting Grant**. His project, called **CoEvolve**, will look at the effects of trace element availability on the metabolic diversity of microbial communities, both in extant ecosystems and through deep time. Read more about the project on Donato's group webpage <https://dgiovannelli.github.io/erccevolve>.

Can we see a change in the CO₂ record because of COVID-19?

Many people are wondering if the signal of the CO₂ emission reduction related to "Covid-19" lockdowns is visible through atmospheric observations. As explained by ICOS (i.e. the Integrated Carbon Observation System), the signal of the reductions is present in the atmospheric observations (see <https://www.icos-cp.eu/event/917>) but it is extremely difficult to directly detect it in the recorded data: accurate and complex analyses are necessary to quantify the contribution. In the meantime, a preliminary analysis of "eddy-covariance" observations in 7 European cities suggests the possibility that reductions of CO₂ anthropogenic emissions due to the "lockdown" can be observed near the sources (to know more visit <https://www.icos-cp.eu/event/933>).

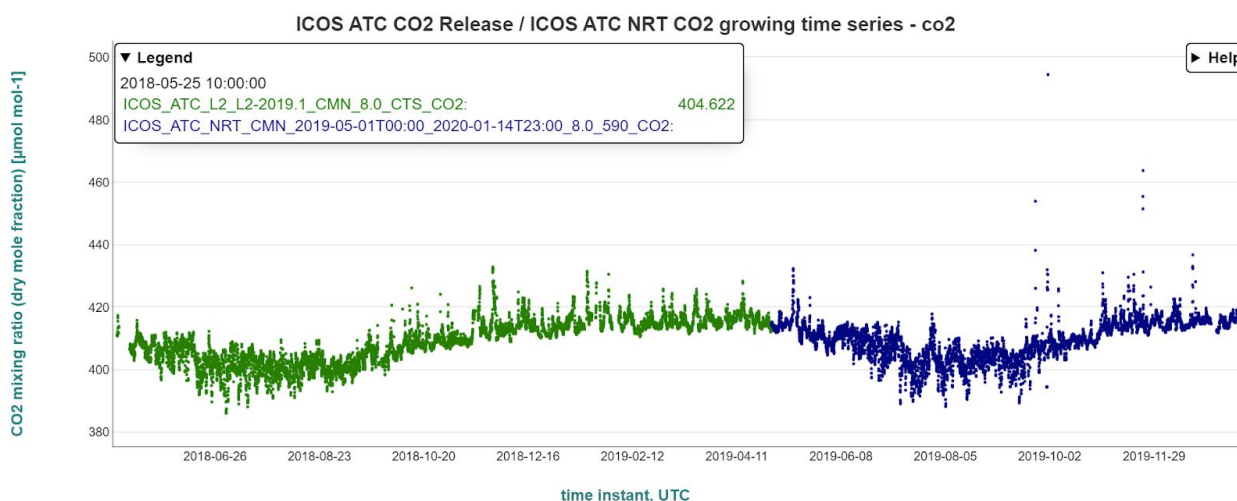
Tree carbon assimilation and radial growth



In June 2020, the LIFE15 ENV/IT/000183 project MOTTLES ended after 4 years. The project established a network of 17 integrated monitoring stations (from air quality to meteorology and soil moisture) at remote forest sites in Italy, Romania and France. Each site is also equipped with 4-5 point dendrometers for real-time recording of tree stem radial growth on the dominant forest species. The integrated monitoring will

continue even after the end of the project and represent the largest data bank of this kind in the world (<https://mottles-project.wixsite.com/life>).

Italian stations got the ICOS label in 2019 - 2020



During 2019 and 2020, 6 stations over the Italian territory obtained the ICOS label for top-quality observations of the carbon cycle: Lison, San Rossore, Paloma, Monte Cimone, Ispra and Lampedusa. These stations joined the associated ecosystem site Torngon (ARPA - Valle d'Aosta, labelled in 2017). Lison (University of Padova) is an ecosystem associated station, while San Rossore is a class 2 ecosystem site managed by JRC. Paloma (managed by CNR) is the only fixed marine station in Italy measuring both atmospheric and dissolved CO₂ in a continuous/quasi-continuous way, thus providing information on carbon uptake and fluxes. Discrete samples for basic parameters (pH, total alkalinity, dissolved inorganic nutrients, dissolved oxygen), are monthly collected. Monte Cimone (managed by CNR in collaboration with the Italian Air Force), Lampedusa (ENEA) and Ispra (JRC) are performing continuous atmospheric observations of carbon dioxide (CO₂), methane (CH₄), carbon monoxide (CO) with high time resolution (1 minute). The ICOS data are available at the Carbon Portal (<https://data.icos-cp.eu/portal/>). Read more: [New main ICOS data releases \(Level 2, final quality controlled data\)](#); ICOS-Italy website: <https://www.icos-italy.it/>.

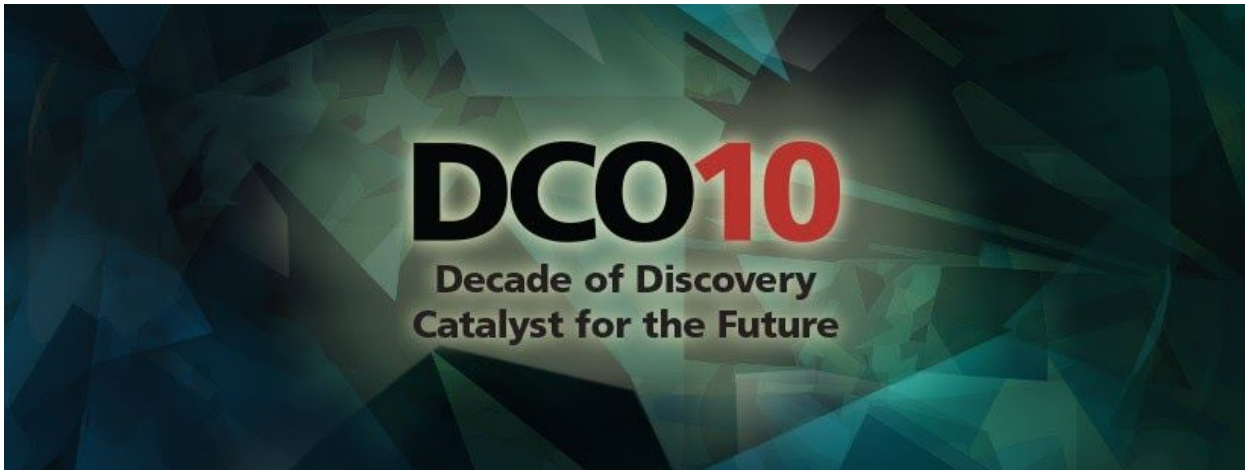
Pushing the limits of carbon capture and storage underground



GECCO is an innovative EU funded research project which aims to provide a clean, safe, and cost-efficient non-carbon and sulfur-emitting geothermal energy across Europe and the World. During the project, the development and implementation of new innovative technologies for the purification of outgoing geothermal gases and re-injection into the extraction sites are planned. In addition, the processes of confinement

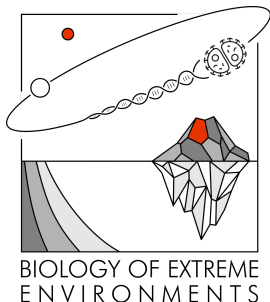
underground or in ad hoc plants where carbon dioxide will be reacted with minerals such as olivine and serpentine to be trapped in the form of newly formed carbonates will be studied (<https://geco-h2020.eu>).

Looking ahead: the next decade of Deep Carbon Observatory



In December 2019, The Deep Carbon Observatory officially closed its first ten years cycle. The initiative, supported from its inception by the Alfred P. Sloan Foundation, has now entered a new phase aimed at sustaining the scientific network created in the past decade. You can read more about the DCO contribution to our understanding of deep carbon in the decadal report “A Decade of Discoveries” and the open access book “Deep Carbon: Past to Present”. A “Deep Carbon” Nature collection (<https://www.nature.com/collections/ccbjbgabec>) also highlights some of the most important articles published by DCO researchers. Follow the DCO on twitter @Deepcarb (<https://twitter.com/deepcarb>).

A new Master Program in the Biology of Extreme Environments at UNINA



A new master program (Laurea Magistrale) in the Biology of Extreme Environments is currently pending approval at the University of Naples “Federico II”. The program is articulated in two curricula, “Biological Resources of Extreme Environments” and “Astrobiology”, and, if approved, will start its activities in September 2021. For more information visit the program webpage at www.bioextreme.it or follow the program on [instagram](#) or [twitter](#) with the handle @LMBExE.

Newsorthy articles

- Ciotoli, G., Procesi, M., Etiope, G. Fracassi, U., Ventura, G. (2020). Influence of tectonics on global scale distribution of geological methane emissions. Nature Communications, 11, 1, DOI: 10.1038/s41467-020-16229-1.

- A global scale analysis of seeps, faults, sedimentary basins, petroleum fields and heat flow, to investigate the geological CH₄ methane emissions.*
- Dean, Joshua F., et al. East Siberian Arctic inland waters emit mostly contemporary carbon. *Nature communications* 11.1 (2020): 1-10.
A study on the terrestrial carbon emission of Arctic permafrost with radiocarbon age measurements of inland water CO₂, CH₄ and dissolved and particulate organic carbon in northeast Siberia during summer.
 - Galvez, M.E., Fischer, W.W., Jaccard, S.L. et al. Materials and pathways of the organic carbon cycle through time. *Nat. Geosci.* 13, 535–546 (2020).
A review of the organic carbon cycle exploring the interactions between the Earth's surface and deeper reservoirs, the expanding inorganic controls on the organic carbon cycle, and these links through geological time.
 - Le Quéré, C., Jackson, R.B., Jones, et al. (2020). Temporary reduction in daily global CO₂ emissions during the COVID-19 forced confinement. *Nature Climate Change*, pp.1-7.
<https://doi.org/10.1038/s41558-020-0797-x>
One of the first published authoritative estimate of global CO₂ emission variations related to COVID-19 crisis based on the compilation of government policies and activity data. To read also to understand the size of the challenge to limit climate change in line with the Paris Climate Agreement.
 - Stefan Becker, Jan Tebben, Sarah Coffinet, Karen Wiltshire, Morten Hvitfeldt Iversen, Tilmann Harder, Kai-Uwe Hinrichs, and Jan-Hendrik Hehemann (2020). Laminarin is a major molecule in the marine carbon cycle. *PNAS* 117 (12) 6599-6607; <https://doi.org/10.1073/pnas.1917001117>.
Laminarin is a sugar polymer constituting 26 ± 17% of biomass of the microalgae inhabiting the sunlit ocean. The discovery of vast quantities of laminarin in the ocean unveils the importance of marine sugars in the global carbon cycle.

Hot off the press

- Collalti A., Ibrom A., Stockmarr A., Cescatti A., Alkama R., Fernández-Martínez M., Ciais P., Sitch S., Friedlingstein P., Goll D.S., Nabel J.E.M.S., Pongratz J., Arneth A., Haverd V., Prentice I.C. (2020). Forest production efficiency increases with growth temperature, *Nature Communications*, 11: 5322, <https://doi.org/10.1038/s41467-020-19187-w>
- Boschi, C., Bedini, F., Baneschi, I., Rielli, A., Baumgartner, L., Perchiazzi, N., Ulyanov, A., Zanchetta, G., Dini, A. (2020). Spontaneous serpentine carbonation controlled by underground dynamic microclimate at the Montecastelli copper mine, Italy. *Minerals*, 10 (1), art. no. 1, <https://doi.org/10.3390/min10010001>.
- Collalti A., Tjoelker M.G., Hoch G., Mäkelä A., Guidolotti G., Heskell M., Petit G., Ryan M.G., Battipaglia G., Prentice I.C. (2020). Plant respiration: Controlled by photosynthesis or biomass?. *Global Change Biology*, <https://doi.org/10.1111/gcb.14857>.
- Gavrichkova, O., Brykova Ramilla, A., Brugnoli, et al. (2020). Secondary soil salinization in urban lawns: microbial functioning, vegetation state and implications for carbon balance. *Land Degradation & Development*. <https://doi.org/10.1002/ldr.3627>
- Pastorello G.Z., et al. (2020). The FLUXNET2015 dataset and the ONEFlux processing pipeline for eddy covariance data. *Scientific Data*, 7:225, <https://doi.org/10.1038/s41597-020-0534-3>.
- Giovannelli, D., Barry, P. H., de Moor, J. M., Lloyd, K. G., and Schrenk, M. O. (2020). Microbial Influences on Subduction Zone Carbon Cycling. *Eos* 101. <https://doi.org/10.1029/2020EO140906>.
- Reyer C.P.O., Silveyra Gonzales R., Dolos K., et al. (2020). The PROFOUND Database for evaluating vegetation models and simulating climate change impact on European forests. *Earth Syst. Sci. Data*, 12, 1295-1320, <https://doi.org/10.5194/essd-12-1295-2020>.
- Retelletti Brogi S., Balestra C., Casotti R., Cossarini G., Galletti Y., Gonnella M., Vestri S., Santinelli C., (2020). Time resolved data unveils the complex DOM dynamics in a Mediterranean river. *Science of The Total Environment*, 733:139212, <https://doi.org/10.1016/j.scitotenv.2020.139212>.

- Sheik, C. S., Li, H. J. C., Johnson-Finn, K., Giovannelli, D., Kieft, T. L., Papineau, D., et al. (2020). Abiotic and biotic processes that drive carboxylation and decarboxylation reactions. *American Mineralogist* 105, 609–615. <https://doi.org/10.2138/am-2020-7166CCBYNCND>.
- Tank, Suzanne E., et al. Landscape matters: Predicting the biogeochemical effects of permafrost thaw on aquatic networks with a state factor approach. *Permafrost and Periglacial Processes* (2020).
- Vitale Brovarone, A., Butch, C. J., Ciappa, A., Cleaves, H. J., Elmaleh, A., Faccenda, M., et al. (2020). Let there be water: how hydration/dehydration reactions accompany key Earth and life processes. *msam*. <https://doi.org/10.2138/am-2020-7380>.
- D'Andrea A., Rezaie N., Prislán P., Gričar J., Collalti A., Muhr J., Matteucci G., (2020) Cold and drought: effects of extreme weather events on Stem Carbon Dynamic in a Mediterranean beech forest, *Plant Cell & Environment*, 43(10):2365–2379, <https://doi.org/10.1002/PCE.13858>.
- Vitale Brovarone, A., Sverjensky, D. A., Piccoli, F., Ressico, F., Giovannelli, D., and Daniel, I. (2020). Subduction hides high-pressure sources of energy that may feed the deep subsurface biosphere. *Nature Communications* 11, 3880. <https://doi.org/10.1038/s41467-020-17342-x>.
- Morrison, S. M., Buongiorno, J., Downs, R. T., Eleish, A., Fox, P., Giovannelli, D., et al. (2020). Exploring carbon mineral systems: Recent advances in C mineral evolution, mineral ecology, and network analysis. *Frontiers in Earth Science* 8, 208.

Our Book Suggestion

A short review of “*We are the Weather, Saving the Planet begins at Breakfast*” by Jonathan Safran Foer (by Fabio Trincardi)

Four people are having dinner in a nice house in Bologna and I am one of them. The conversation is on how humans are responsible for climate change; we all recognise that the problem is serious, that greenhouse gasses come from fossil fuels and dramatic changes in land use. No doubt we belong to the first generation that will leave to younger generations a planet in far worse shape than the one we received from our ancestors. Soon the polite and educated host identifies the “enemy” as the big oil companies, leaving us no role other than voting against, protesting, if it is not too hot outside and if we find a convenient parking space for the car, meanwhile we stay home discussing the temperature of our roast beef. The situation is serious and planet Earth will hardly be shepherded below the 1.5 °C of the Paris agreement, but the general feeling is that there is almost nothing we can do. Is that true?

An excellent and innovative book by Jonathan Safran Foer, entitled “*We are the Weather, Saving the Planet begins at Breakfast*” and recently translated into Italian, explains very well how humans have impacted the concentration of greenhouse gasses. The book has the added value of bringing forward the considerations developed by Amitav Ghosh, in *The Great Blindness*, when he asks why we are so reluctant to take our responsibility and to act/choose as citizens and consumers to help decrease the footprint of our species on the environment and on the climate systems. Safran Foer offers a reason and a way to act: reduce the consumption of meat, particularly that coming from intensive, now even automated, industrial farms. Indeed the book shows how the planet is now reduced to a farm, with 83% of on land mammals disappeared and 50% of the original wild life offshore gone and with 30 billion chicken living short lives before ending up in our guts. In addition, farming drives 80% of the ongoing deforestation. Even more interesting, the very impact of farming on global C budgets still appears difficult to pin down and ranges between 14.5 and 51% of the total of greenhouse gasses released in the atmosphere, a three-fold uncertainty, and the Appendix of the book explains how. Two chapters are particularly effective: Chapter 2 concentrates on how to avoid mass extinction and offers a set of compelling data, in several PPT-like bullet lists; Chapter 4, written in a rather different style, reports a dispute between the Author and his Soul exactly on the ethical question of what to do, rather than simply identifying generic enemies or those responsible (e.g. “Industry”); we should act as individuals and as a society and this is necessary to stop global warming and to keep the greenhouse gasses concentration within the Paris agreement.

Convincingly the book indicates the abandonment, or at least the substantial reduction, of meat consumption as the most practical way to help curtail the CO₂ and CH₄ increase in the Atmosphere; a strategy that can be adopted by each of us. I had some fantastic roast beef just two weeks ago, during that dinner, but, after reading this book, I am happy to admit that it was my last time.

Upcoming Events



Arctic Science Summit Week 2021, “The Arctic: regional Changes, global Impacts”, will take place in Lisbon from 20 to 26 March 2021. All the information could be found following the link: <https://assw2021.pt/>



2nd International Conference on ‘Processes and Palaeo-environmental changes in the Arctic: from past to present (PalaeoArc)’. The PalaeoArc is a network research programme aiming to further understand past and present environmental changes and processes in the Arctic. The Conference was rescheduled for the 24th-28th of May 2021, in Pisa; <http://palaeoarc2020.dst.unipi.it>.



Offshore-Mediterranean-Conference OMC 2021, “Rethinking Energy together: alliances a sustainable energy future” will take place in Ravenna, Italy, from 25 to 27 May 2021. For more information: www.omc.it.



Goldschmidt2021 will take place in Lyon (France) from 4 to 9 July 2021. For more information <https://2021.goldschmidt.info/goldschmidt>



Summer field school 3MUGIS: ANTHROPOGENIC AND NATURAL SOIL LANDSCAPES IN EUROPEAN RUSSIA: FROM SEA TO SEA will take place between July 26 and August 15, 2021. For more information visit <http://3mugis.org/>



Eurosoil 2021 conference will take place in Geneva (Switzerland) from 23 to 17 of August. For more information visit <https://eurosoil-congress.com/>

Funding Opportunities

ERC Starting Grant 2021. The ERC Starting Grants is the EU program to fund innovative basic research on any topic. ERC Starting Grants may be awarded up to € 1.5 million for a period of 5 years. The next deadline is April 8th 2021. <https://erc.europa.eu/funding/starting-grants>

Life Programme. The LIFE programme is the EU's funding instrument for the environment and climate action. All the information could be found following the link: <https://ec.europa.eu/easme/en/section/life/calls-proposals>

Currently active LIFE calls:

<https://ec.europa.eu/easme/en/section/life/life-2020-call-proposals-ngos-european-green-deal-ngo4gd>

Belmont forum. Belmont Forum has developed Collaborative Research Actions (CRAs). A complete list of active and past CRAs could be found following the link: <https://www.belmontforum.org/cras/>

Fondazione Cariplo. There were published funding opportunities by Fondazione Cariplo for the year 2021. All the information could be found following the link: <https://www.fondazionecariplo.it/it/bandi/index.html>.

Employment Opportunities

Three Assistant Professors in Earth Sciences (0.8 - 1.0 FTE, tenure track) at the Utrecht University Utrecht, Netherlands. For more information:

https://www.researchgate.net/job/949602_Three_Assistant_Professors_in_Earth_Sciences_08-10_FTE_tenure_track

Post-doc on carbon cycle models with respect to land use, carbon sequestration, and climate change. For more information: <https://johnmuir.ucdavis.edu/about/jobs/jmie>

Two 3-yr Postdoc Positions in Climate and Carbon Cycle Science at Augsburg University (Germany). For more information:

https://www.researchgate.net/job/949812_Two_3-year_Postdoc_Positions_in_Climate_and_Carbon_Cycle_Science_in_Augsburg_Germany

Post-Doc Isotopic studies of the greenhouse gases budget (N₂O / CO₂) in soils receiving carbonate liming products at the University Bourgogne Franche-Comté (Dijon, France). For more information:

https://www.researchgate.net/job/948268_Post-Doc_Isotopic_studies_of_the_greenhouse_gases_budget_N2O_CO2_in_soils_receiving_carbonate_liming_products

Post Doctoral Researcher in Modelling of the Forest Carbon Cycle at the University of Limerick (Luimneach, Ireland). For more information:

https://www.researchgate.net/job/949886_Post_Doctoral_Researcher_in_Modelling_of_the_Forest_Carbon_Cycle-Specific_Purpose_Contract

PhD fellowships in Ecological and Environmental Informatics. For more information

<https://ecoinfo.nau.edu/index.php/presidential-fellowship/>

PhD position on project CARBOSTORE - natural carbon storage in the North and Baltic Sea; Helmholtz Zentrum Geesthacht, Germany. For more information:

<https://www.hzq.de/career/vacancies/018977/index.php.en>

Vacancies, including PhD positions in the Earth, planetary and space sciences could be found visiting

<https://www.egu.eu/jobs/>

Master in Urban Studies 4cities. For more information <https://www.4cities.eu/>

Graduate student opportunities in Arctic Paleoclimatology at the University at Buffalo and Northern

Arizona University, starting Summer or Fall 2021. Details here: <https://ubwp.buffalo.edu/rapidarcticwarming/>

Useful links

- ICOS <https://www.icos-cp.eu/r>

- DCO <https://deepcarbon.net/>

- IPCC <https://www.ipcc.ch>

- IODP <http://www.iodp.org>

-SOLAS <http://ww.solas-int.org>

Visita la pagina dedicata <http://www.dta.cnr.it/2020/06/09/ciclo-del-carbonio/>

Per i tuoi commenti, per segnalare opportunità ed eventi scrivi all'indirizzo carbonnetwork@cnr.it

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Our Goodbye

The measure of intelligence is the ability to change (A. Einstein)



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