

CURRICULUM VITAE: MAURO RUBINO

1. Personal data

Birth: Salerno, Italy; June 4th 1978
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1. Employment history

Current positions

2022-on going **Associate Professor** at University of Campania (former Second University of Naples - SUN), Department of Maths and Physics (DMF)
2013-on going **Visiting scientist** at CSIRO (Commonwealth Scientific and Industrial Research Organization) Oceans and Atmosphere flagship, in Aspendale (Victoria, Australia)

Previous positions

2019-2022 **Researcher** at University of Campania (former SUN), Department of Maths and Physics (DMF)
2018-2019 **Lecturer** at the School of Geography, Geology and the Environment, Keele University (UK)
2013-2017 **Research associate** at University of Campania (former SUN), Department of Maths and Physics (DMF)
2012-2013 **Research scientist** at CSIRO, Marine and Atmospheric Research
2008-2012 **Post-doc** fellowship at CIC (Centre for Ice and Climate), Niels Bohr Institute, University of Copenhagen, based at the CSIRO, Marine and Atmospheric Research (Australia)
2007-2008 **Post-doc** fellowship at INRA (Institut National de la Recherche Agronomique), Chimie des Sols et des Eaux, in Aix en Provence (France)
2006-2007 **Post-doc** fellowship at SUN, Department of Environmental Science
2002-2005 **Phd** scholarship at SUN, Department of Environmental Science
2002-2002 **Research contract** at the Department of Physics, University of Florence

2. Higher education

2002-2006 **Ph.D.** Department of Environmental Science, SUN, thesis title: *Carbon fluxes during leaf litter decomposition: from leaf litter to soil organic matter and to atmospheric CO₂*
1996-2002 **MSc** (laurea) Environmental Science, SUN (110/110 cum laude)
2000 **Piano degree** (music school "S. Pietro a Majella", Naples)

3. Grants, contracts and scholarships

2022 **Erasmus for research collaboration** (€5,000) from Vanvitelli University to visit the University of Hokkaido and the Japan Atomic Energy Agency (JAEA)
2018 **Research Development Fund** (£3,500) from the Faculty of Natural Science at Keele University for a research visit at CSIRO (Aspendale, Vic, Australia)
2017 **Ranked 1st** at the CNR (Consiglio Nazionale delle Ricerche) open call for a position as a Researcher at Istituto per la dinamica dei processi ambientali (Mestre, Italy).
2017 **Habilitation** in Applied Physics (Physics applied to cultural heritage, environment, biology and medicine)
2016 **Best poster** at the IPICS (International Partnership of Ice Core Science) 2016 conference
2016 **External consultancy** (\$20,000 AUD) CSIRO, Icelab database development
2015 **Short-term collaboration** (€4,000) SUN, Department of Maths and Physics, develop a method to extract actinides from soil samples and measure their isotopic ratio
2014 **Contract to teach**: tutor of high school (Liceo Alberti, Naples, Italy) students learning how to perform measurements of isotopic ratios
2006 **Grant** (€5,000) from ESF-SIBAE (European Science Foundation - Stable Isotopes in Biosphere-Atmosphere Exchange) for an exchange period at the School of Chemistry, University of Bristol (UK)

- 2004 **Contract to teach:** “Energy and Environment” to post-graduate students (Istruzione e Formazione Tecnica Superiore, Naples, Italy)
- 2004 **Grant** (€5,000) from ESF-SIBAE for an exchange period at Max Planck Institute for Biogeochemistry (Jena, Germany)
- 2004 **Contract to teach:** “Gaia: the planet under investigation” to undergraduate students (High school: liceo statale F. Severi, Salerno, Italy)
- 2002- 2005 **Phd scholarship** in “Development of isotopic methodologies and applications to environmental science”, at the Second University of Naples-Department of Environmental Science

4. Research projects

- 2023 € 1400000, FISA (Fondo Italiano Scienze Applicate), research proposal to develop a gas source for Accelerator Mass Spectrometry (AMS) selected for funding, **PI**
- 2021 65,000 €, Contract with the A2A company, managing the waste-to-energy plant of Acerra (Naples) for the quantification of its CO₂ fossil emissions, **PI**
- 2020 23,787 €, V:ALERE (Vanvitelli per la ricerca) 2020 program, funds for applied research: quantification of fossil fuel CO₂ emissions from the waste-to-energy plant of Acerra (Napoli) tramite misure di ¹⁴C-CO₂, **PI**
- 2016 €1,849,644, European Research Council - Consolidator Grant: "PastA: Assessing the causes of variations of PAST Atmospheric CO₂ concentration from measurements of concentration and isotopic composition of molecular organic tracers in ice cores", **PI** (this proposal has made it to the interview stage of the evaluation procedure, but has not been funded because it has scored B ("meets some but not all the elements of the ERC's excellence criterion").
- 2015 €19,367, funding from Campania region: “Development of a method to measure the isotopic ratio of Boron (^{δ¹¹B}) by means of Accelerator Mass Spectrometry (AMS)”, Second University of Naples, **post-doc support**
- 2014 €19,367, funding from Istituto Statale per la Prevenzione e la Ricerca Ambientale “Isotopic methods to identify source of nitrates in groundwater and soil of the Po valley (North Italy)”, Second University of Naples, **post-doc support**
- 2013 €19,367, funding from Campania region “Isotopic methods to identify processes releasing or sequestering greenhouse gases associated with energy production”, Second University of Naples, **post-doc support**
- 2012 \$147,500 (AUD), Australian Climate Change Science Program (ACCSP): “Novel biogeochemical tracers in firn and ice”, CSIRO, Melbourne, **post-doc support**
- 2009 \$619,793 (AUD), Australian Climate Change Science Program (ACCSP): “Land and ocean carbon feedbacks in the palaeo record”, **post-doc support**
- 2008 DKK41,365,000, Danish Government: "North Greenland EEMian Ice Drilling (NEEM)", **post-doc support**
- 2007 €2,000,047, “DYNAMOS - Dynamique de la Matière Organique des Sols”, INRA, **post-doc support**
- 2006 €38,700, funding from Campania region, legge 5: “Implementation and use of an innovative isotope methodology for the quantification of C fluxes and stores in soils”, **post-doc support**
- 2004 €72,000, European Research Council: “A FACE experiment on a short rotation poplar plantation – POPFACE”, **PhD project**

5. Publications – *h* index (January 2024, scopus.com): 21

2021

- A33. Marzaioli F, Di Rienzo B, Stellato L, Di Fusco E, **Rubino M**, D'Onofrio A, Terrasi F, Characterization of the analytical performance of ^{δ¹⁵N} and ^{δ¹⁸O} measurements by the silver nitrate method in the framework of nitrate source apportioning. *Rapid Commun Mass Spectrom.* 2021;35:e9009

2020

- A32. Fogwill, C.J., Turney, C.S.M., Menviel, L., A. Baker, M. E. Weber, B. Ellis, Z. A. Thomas, N. R. Golledge, D. Etheridge, **M. Rubino**, D. P. Thornton, T. D. van Ommen, A. D. Moy, M. A. J. Curran, S. Davies, M. I. Bird, N. C. Munksgaard, C. M. Rootes, H. Millman, J. Vohra, A. Rivera, A. Mackintosh, J. Pike, I. R. Hall, E. A. Bagshaw, E. Rainsley, C. Bronk-Ramsey, M. Montenari, A. G. Cage, M. R. P. Harris, R. Jones, A. Power, J. Love, J. Young, L. S. Weyrich & A. Cooper (2020) Southern Ocean carbon sink enhanced by sea-ice feedbacks at the Antarctic Cold Reversal. *Nature Geoscience* 13, 489–497
- A31. Turney C. S. M., Fogwill C. J., Golledge N. R., McKay N. P., van Sebille E., Jones R. T., Etheridge D., **Rubino M**, Thornton D. P., Davies S. M., Ramsey C. B., Thomas Z. A., Bird M. I., Munksgaard N. C., Kohno M., Woodward J., Winter K., Weyrich L. S., Rootes C. M., Millman H., Albert P. G., Rivera A., van Ommen T., Curran M., Moy A., Rahmstorf S., Kawamura K., Hillenbrand C. -D., Weber M. E., Manning C. J., Young J.,

Cooper A. (2020) Early Last Interglacial ocean warming drove substantial ice mass loss from Antarctica, *PNAS*, 117: 3996-4006

2019

- A30. **Rubino**, M. Etheridge, D.M. Thornton, D.P. Howden, R. Allison, C.E. Francey, R.J. Langenfelds, R.L. Steele, L.P. Trudinger, C.M. Spencer, D.A. Curran, M.A.J. van Ommen, T.D. and Smith, A.M. (2019) Revised records of atmospheric trace gases CO₂, CH₄, N₂O, and $\delta^{13}\text{C}$ -CO₂ over the last 2000 years from Law Dome, Antarctica, *Earth System Science Data*, 11: 473-492

2018

- A29. Vignola, C. Masi, A. Balossi Restelli, F. Frangipane, M. Marzaioli, F. Passariello, I. **Rubino**, M. Terrasi, F. Sadori, L. (2018) $\delta^{13}\text{C}$ values in archaeological ¹⁴C-AMS dated charcoals: assessing mid-Holocene climate fluctuations and human response from a high-resolution isotope record (Arslantepe, Turkey), *Rapid Communications in Mass Spectrometry*, 32:1149-1162

2017

- A28. Graven, H. Allison, C.E. Etheridge, D.M. Hammer, S. Keeling, R.F. Levin, I. Meijer, H.A.J. **Rubino**, M. Tans, P.P. Trudinger, C.M. Vaughn, B.H. and White, J.W.C. (2017) Compiled records of carbon isotopes in atmospheric CO₂ for historical simulations in CMIP6, *Geoscientific Model Development*, 10, 4405-4417
- A27. Di Fusco, E., **Rubino**, M., Di Rienzo, B., Stellato, L., Marzaioli, F., Ricci, A., Porzio, G., Terrasi, F., D'Onofrio, A. (2017) Measurements of $\delta^{11}\text{B}$ in water by use of a mass spectrometer with accelerator, *NIMB*, 412: 109-114
- A26. Meinshausen, M., Vogel, E., Nauels, A., Lorbacher, K., Meinshausen, N., Etheridge, D., Fraser, P., Montzka, S.A., Rayner, P., Trudinger, C., Krummel, P., Beyerle, U., Canadell, J.G., Daniel, J.S., Enting, I., Law, R.M., Lunder, C.R., O'Doherty, S., Prinn, R.G., Reimann, S., **Rubino**, M., Velders, G.J.U., Vollmer, M.K. (2017) Wang, R.H.J., Weiss, R. Historical greenhouse gas surface concentrations from year 0 to 2014 for CMIP6, *Geoscientific Model Development*, 10: 1-60
- A25. Fogwill, C., Turney, C., Golledge, N.R., Etheridge, D., **Rubino**, M., Thornton, D.P., Baker, A., Woodward, J., Winter, K., van Ommen, T.D., Moy, A., Curran, M., Davies, S., Weber, M.E., Bird, M., Munksgaard, N., Menviel, L., Rootes, C.M., Ellis B., Millman, H., Vohra J., Rivera, A.N., Cooper A. (2017) Sustained Antarctic contribution to abrupt global sea level rise during Meltwater Pulses 1A and 1B, *Scientific Reports*, 7, 39979

2016

- A24. Stellato, L., Di Rienzo, B., Di Fusco, E., **Rubino**, M., Marzaioli, F., Allocca, V., Salluzzo, A., Rimauro, J., Romano, N., Celico, F. (2016) Surface water - Groundwater connectivity implications on nitrate cycling assessed by means of hydrogeologic and isotopic techniques in the Alento river basin (Salerno, Italy): Preliminary data *Rendiconti Online Societa Geologica Italiana*, 41: 80-83
- A23. Jenk, T. **Rubino**, M., Etheridge, D. Ciobanu, V.G. Blunier, T. (2016) A new setup for simultaneous high precision measurements of paleo-atmospheric CO₂, $\delta^{13}\text{C}$ -CO₂ and $\delta^{18}\text{O}$ -CO₂ on small ice core samples, *Atmospheric Measurement Techniques*, 9(8): 3687-3706
- A22. **Rubino**, M., Etheridge, D.M. Trudinger, C.M. Allison, C.E. Rayner P.J. Enting, I. Mulvaney, R. Steele, L.P. Langenfelds, R.L. Sturges, W.T. Curran, M.A.J. Smith, A.M. (2016) Low atmospheric CO₂ during the Little Ice Age due to cooling-induced terrestrial uptake, *Nature Geoscience*, 9: 691-694
- A21. **Rubino**, M., D'Onofrio, A., Seki, O., Bendle, J. (2016) Ice core records of biomass burning, *The Anthropocene Reviews*, 3(2): 140 -162

2014

- A20. **Rubino**, M., Milin, S., D'Onofrio, A., Signoret, P., Hatté, C., Balesdent, J. (2014) Measurement of the ¹³C/¹²C ratio of soil amino acids by IRMS of trimethylsilyl derivatives: first assessment. *Isotopes in Environmental and Health Studies*, 50(4): 516-530
- A19. Helmig, D. Petrenko, V. Martinerie, P. Witrant, E. Roeckmann, T. Zuiderweg, A. Holzinger, R. Hueber, J. Stephens, C. Sturges, W. Baker, A. Blunier, T. Etheridge, D. **Rubino**, M. Tans, P. Parrish, D. (2014) Reconstruction of Northern Hemisphere 1950 – 2010 Non-Methane Hydrocarbon Emissions, *Atmospheric Chemistry and Physics*, 14: 1463-1483

2013

- A18. Turney, C. Fogwill, C. van Ommen, T. Moy, A. Etheridge, D. **Rubino**, M. Curran, M. Rivera, A. (2013) Late Pleistocene and early Holocene Change in the Weddell Sea: A New High-Resolution Climate Record from Patriot Hills, Ellsworth Mountains, West Antarctica, *Journal of Quaternary Science*, 28 (7): 697–704
- A17. **Rubino**, M. Etheridge, D.M. Trudinger, C. Allison, C. Battle, M.O. Langenfeld, R.L. Steele, L.P. Curran, M. Bender, M. White, J.W.C. Jenk, T. Blunier, T. Francey, R. (2013) A revised 1000 year atmospheric $\delta^{13}\text{C}$ -CO₂ record from Law Dome and South Pole, Antarctica, *Journal of Geophysical Research*, 118: 8482–8499 (**AGU spotlight in EOS**)
- A16. Trudinger C., Enting, I., Rayner, P. Etheridge, D. Buizert, C. **Rubino**, M. Krummel, P. B. Blunier, T. (2013) How well do different tracers constrain the firn diffusivity profile? *Atmospheric Chemistry Physics*, 13, 1485–1510

A15. NEEM Community – including **Rubino** (2013) Eemian interglacial reconstructed from a Greenland folded ice core, *Nature*, 493 (7433): 489-494

2012

A14. Ricci P., Mongelli V., Vitiello A., Campana S., Sirignano C., **Rubino** M., Fornaciari G., Lubritto, C. (2012) The privileged burial of the Pava Pieve (Siena, 8th century AD), *Rapid Communications in Mass Spectrometry*, 26(20): 2393-2398

A13. Ahn J., Brook E.J., Mitchell L., Rosen J., McConnell J.R., Taylor K., Etheridge D., **Rubino** M. (2012) Atmospheric CO₂ over the last 1000 years: A high resolution record from the West Antarctic Ice Sheet (WAIS) Divide ice core, *Global Biogeochemical Cycles*, 26: GB2027

A12. Buizert, C. Martinerie, P. Petrenko, V.V. Severinghaus, J.P. Trudinger, C.M. Writant, E. Rosen, J.L. Orsi, A. **Rubino**, M. Etheridge D.M. Steele, L.P. Hogan, C. Laube, J.C. Sturges, W.T. Levchenko, V.A. Smith, A.M. Levin, I. Conway, T.J. Dlugokencky, E.J. Lang, P.M. Kawamura, K. Jenk, T.M. Sowers, T. Schwander, J. Blunier, T. (2012) Multiple-tracer firn air transport characterisation and model intercomparison for NEEM, Northern Greenland, *Atmospheric Chemistry and Physics*, 12: 4259-4277

2010

A11. **Rubino** M., Dungait J.A.J., Evershed R.P., Bertolini T., De Angelis P., D'Onofrio A., Lagomarsino A., Lubritto C., Merola A., Terrasi F., Cotrufo M.F (2010), Carbon input belowground is the major C flux contributing to leaf litter mass loss: Evidences from a ¹³C labelled-leaf litter experiment, *Soil Biology & Biochemistry*, 42 (7): 1009-1016

2009

A10. **Rubino** M., Lubritto C., D'Onofrio A., Terrasi F., Kramer C., Gleixner G., Cotrufo M. F. (2009) Isotopic evidences for microbiologically mediated and direct C input to soil compounds from three different leaf litters during their decomposition, *Environmental Chemistry Letters*, 7: 85-95

2007

A9. **Rubino** M. Lubritto C., D'Onofrio A., Terrasi F., Gleixner G., Cotrufo M. F. (2007), An isotopic method for testing the influence of leaf litter quality on carbon fluxes during decomposition, *Oecologia*, 154:155-166

A8. Terrasi F., Rogalla D., De Cesare N., D'Onofrio A., Lubritto C., Marzaioli F., Passariello I., **Rubino** M., Sabbarese C., Casa G., Palmieri A., Gialanella L., Imbriani G., Roca V., Romano M., Sundquist M., Loger M. (2007), A new AMS facility in Caserta, Italy. *Nuclear Instrument and Methods in Physics Research B*. 259 (1): 14-17

A7. Passariello, I., Marzaioli, F., Lubritto, C., **Rubino**, M., D'Onofrio A., De Cesare N., Borriello G., Casa G., Palmieri A., Rogalla D., Sabbarese C., Terrasi F. (2007) Radiocarbon sample preparation at the CIRCE AMS laboratory in Caserta, Italy. *Radiocarbon*, 49 (2): 225-232

2006

A6. Scarabino, C. C. Lubritto, A. Proto, G. Fiengo, **Rubino** M., Fiengo G., Marzaioli F., Passariello I., Busiello G., Fortunato A., Alfano D., Sabbarese C., Rogalla D., De Cesare N., D'Onofrio A., Terrasi F. (2006) Paleodiet characterization of an Etrurian population (Pontecagnano, Salerno, Italy) by Isotope Ratio Mass Spectrometry (IRMS) and Atomic Absorption Spectrometry (AAS), *Isotopes in Environmental and Health Studies*, 42, 2: 151-158

A5. Bertolini T., Inglema I., **Rubino** M., Marzaioli F., Lubritto C., Subke A.J., Peressotti A., Cotrufo M.F. (2006), Sampling soil derived CO₂ for analysis of isotopic composition: a comparison of different techniques, *Isotopes in Environmental and Health Studies*, 42, 1: 1-9

A4. Liberloo M., Calfapietra C., Lucak M., Godbold D., Luo Z.B., Polle A., Hoosbeek M. R., Kull O., Marek M., Christine R., **Rubino** M., Taylor G., Scarascia-Mugnozza G., Ceulemans R. (2006) Woody biomass production during the second rotation of a bio-energy Populus plantation increases in a future high CO₂ world, *Global Change Biology*, 12: 1094-1106

2005

A3. Marzaioli. F., Lubritto C., Battipaglia G., Passariello I., **Rubino** M., Rogalla D., Strumia S., Miglietta F., D'Onofrio A., Cotrufo M.F., Terrasi F. (2005) Reconstruction of past CO₂ concentration in a natural enriched site using radiocarbon dating. *Radiocarbon*, 47, 2: 257-263

A2. Bertolini T., **Rubino** M., Lubritto C., D'Onofrio A., Marzaioli F., Passariello I., Terrasi F. (2005) Optimized sample preparation for isotopic analyses of CO₂ in air: systematic study of precision and accuracy dependence on driving variables during CO₂ purification process. *Journal of Mass Spectrometry*, 40: 1104-1108

2004

A1. Lubritto, C. D. Rogalla, **Rubino** M., Marzaioli F., Passariello I., Romano M., Spadaccini G., Casa G., Di Leva A., De Cesare N., D'Onofrio A., Gialanella L., Imbriani G., Palmieri A., Roca V., Rolfs C., Sabbarese C., Strieder F., Schuermann D., Terrasi F. (2004) Accelerator mass spectrometry at the 4 MV Dynamitron Tandem in Bochum, *Nuclear Instruments and Method B*, 222: 255-260

Peer-reviewed conference proceedings

2008

- B4. Lubritto, C. F. Terrasi, A. D'Onofrio, C. Sabbarese, F. Marzaioli, I. Passariello, A. Palmieri, G. Casa, D. Rogalla, **Rubino M.**, Imbriani G., Romano M., Gialanella L., Roca V., Rolfs C., Giancaspro M., Travaglione A. (2008) Accelerator mass spectrometry dating of epicurus "De natura" papyrus from Herculaneum, Proceedings of the 4th Symposium of the Hellenic Society for Archaeometry, National Hellenic Research Foundation, Athens 28-31 May 2003

2006

- B3. Lubritto, C. Terrasi F., D'Onofrio, Sabbarese, C. Marzaioli, F. Passariello, I. Rogalla, D. **Rubino M.**, De Cesare N., Romano M., Gialanella L., Roca V., Rolfs C., Albore Livadie C., Vecchio G. (2006) Accelerator mass spectrometry dating of archaeological samples from Nola area (Naples, Campania, Italy), Proceedings of Archaeometry 2004, 34th International Symposium on Archaeometry, 3-7 May 2004, Zaragoza, Spain
- B2. Terrasi, F. Rogalla, D. Lubritto, C. Marzaioli, F. Passariello, I. **Rubino M.**, Battipaglia G., Casa G., Cotrufo M.F., D'Onofrio A., Palmieri A., Sabbarese C., Strumia S., De Cesare N., Gialanella L., Imbriani G., Roca V., Romano M., Miglietta F., Rolfs C., Albore Livadie C., Vecchio G. (2006) Dal primo sistema AMS in Italia al laboratorio CIRCE, Atti del Convegno A.I.Ar. (Associazione italiana di Archeometria), Caserta, 16-18 febbraio 2005: Innovazioni tecnologiche per i beni culturali in Italia, 9-18, Patron editore, Bologna
- B1. Campana, S. Felici, C. Francovich, R. Marasco, L. Lubritto, C. Passariello, I. Marzaioli, F. De Cesare, N. **Rubino M.**, Borriello G., D'Onofrio A., Terrasi F. (2006), L'utilizzo delle datazioni al radiocarbonio nel sito archeologico di Pava, Atti del Convegno A.I.Ar. (Associazione italiana di Archeometria), Caserta, 16-18 febbraio 2005: Innovazioni tecnologiche per i beni culturali in Italia, 9-18, Patron editore, Bologna

Submitted or in preparation

- C3 De Moraes Mouco, I., Qamar, S.A., Petraglia, A., Piccolella, S., **Rubino M.**, Buono, M., Pacifico, S., Ischnosiphon arouma (Aubl.) Körn: An unexplored yet versatile source of cellulose, in preparazione per *Green Chemistry*
- C2 Capone, B., Marzaioli, F., Passariello, I., Porzio, G., **Rubino M.**, Di Palma, A., Terrasi, F., Is TiH2 really necessary for Zn reduction? Discussion on graphitisation at CIRCE Laboratory, in preparazione per *Radiocarbon*
- C1 **Rubino M.**, Sirignano, C., Chianese, E., Hernández-Ceballos, M.A., Riccio, A., Multiple lines of evidence help identify the sources of Nitrogen and Carbon in particulate matter sampled in the historical center of Naples (Italy), in preparazione per *Atmosphere*

Technical reports

- D1. La contaminazione da nitrati nelle acque: applicazione di un modello isotopico nelle regioni del bacino del Po, della pianura veneta e del Friuli Venezia Giulia, ISPRA rapporti 217/2015, <http://www.sintai.sinanet.apat.it/view/index.faces>

6. Teaching and supervising

- 2019-on going **Lecturer in applied physics**, modules: Physics (Department of Engineering and Environmental Science), Environmental physics (Department of Physics), Ecological climatology (Master of Physics), Models and tools for weather prediction and climate (Master of Physics)
Supervisor of Bachelor, Master and PhD students
- 2018-2019 **Lecturer of Environmental Science**, modules: Biogeochemical cycles and global change, Human Impacts on the Environment
- 2017-2019 **Visiting Professorship** at the International University of Gorazde (Bosnia and Herzegovina), course of Biophysics at the Department of European Studies 'Jean Monnet'
- 2013-2016 **Co-supervisor 1 PhD thesis** at the Department of Maths and Physics (Second University of Naples)
- 2007 - 2008 **Co-supervisor 1 undergraduate thesis** at the Institut National de la Recherche Agronomique (INRA, in collaboration with the University of Marseille)
- 2006-2007 **Co-supervisor of 2 master theses** at the Faculty of Environmental Science (Second University of Naples)
- 2002-2006 **Teaching assistantship** in physics and ecology courses at the Faculty of Environmental Science (Second University of Naples);
- 2004 **Teacher** of "Energy and Environment" to post-graduate students (IFTS, Naples)
- 2004 **Teacher** of "Gaia: the planet under investigation" to undergraduate students (High school: liceo statale F. Severi, Salerno)
- 2002-2006 **Tutoring** for students at the Faculty of Environmental Science (Second University of Naples)

7. Talks and seminars

8.1 Invited

- 2012 **AGU**, San Francisco, session C040: The Ice Core Record of Carbon Cycle History and Processes, “A revised atmospheric $\delta^{13}\text{C}$ -CO₂ record covering the last 1000 years from Law Dome, Antarctica”
- 2012 **La Trobe University**, Melbourne, Department of Chemistry, “Applications of chemistry to atmospheric science”
- 2008 **IV course for PhD students** in forestry-environmental science (Università della Tuscia – CSALP, Pieve Tesino, Trento), “Carbon fluxes during litter decomposition: from leaf litter to soil organic matter and to atmospheric CO₂”

8.2 Selected conference oral presentations

- 2015 Rome, Science Symposium on Climate (**Rome2015**)
- 2015 Vienna, European Geoscience Union (**EGU**)
- 2013 Beijing, 9th International Carbon Dioxide Conference (**ICDC9**)
- 2012 San Francisco, **AGU** fall meeting
- 2012 Leipzig, at the “Joint European Stable Isotopes Users Meeting (**JESIUM**)”
- 2011 5th Annual Workshop at the “Centre for Australian Weather and Climate Research (**CAWCR**)”
- 2009 retreat meeting at the Center for Ice and Climate (**CIC**)
- 2007 Aix en Provence, “9th International Meeting on Soil with Mediterranean Type of Climate”, at **INRA**
- 2006 Belfast, “The 5th International Conference on Application of Stable Isotope Techniques to Ecological Studies (**ISOECOL 5th**)”

8. Field experience

- 2014 **Alento (Salerno, Italy)** river Basin analysis, ground- and surface water sampling
- 2009 **NEEM** (North Greenland Eemian) ice coring project
- 2004-2006 **EUROFACE** elevated CO₂ (Free Air Carbon Enrichment) experimental site of Tuscania (Viterbo, Italy).

9. Post-graduate training

- 2012 On-line course to become a Australian Quarantine Approved Premises Accredited Person
- 2010 Melbourne, course on Safety with liquid Gaseous Nitrogen and Dewar Decanting
- 2003 Rome, “1st course on the use of ICP (Inductively Coupled Plasma) mass spectrometry for determination of inorganic contaminants in animal derived foods”
- 2002 Lisbon, “NETCARB (Network for Ecophysiology in Closing Terrestrial CARbon Budget) summer school”
- 2002 Caserta, “Theory, applications and instrumentation of mass spectrometry”

10. Public engagement, dissemination and media outreach

- 2016-2017 Futuro Remoto, Naples, Piazza del Plebiscito, <http://www.cittadellascienza.it/futuroremoto/2016/>
- 2016-2017 European Researchers' night, Caserta, Royal Palace, <http://www.matfis.unina2.it/ricerca/nottericercatori>
- 2013 NEEM community paper press release <http://www.abc.net.au/am/content/2013/s3675402.htm>;
- 2013 <http://www.sbs.com.au/yourlanguage/italian/highlight/page/id/258410/t/Climate-change-seen-from-Greenland/>

11. Professional activities

- **Invited evaluator of proposals** for the European Commission under the programme Horizon 2020 (ERC and Societal Challenge) and for the French Academy of Science (ANR)
- **Article reviewer** for Atmospheric Chemistry and Physics, Atmospheric Environment, Biogeosciences, Nature Communications, Nature, Global Change Biology, Environmental Pollution, Ecosystems, Geoderma, Earth and Planetary Science, Annals of forest science, Journal of Geophysical Research, The Chryosphere
- **Author of a proposal** on development of best practices of waste management for the European Commission under the programme LIFE

12. Hobby

I have performed as a piano soloist and as a choir accompanist. I am passionate about Argentinean tango and am trying to learn how to play bandoneon. I have composed the music for a musical for children.

Summary of my research activity and achieved results

I am an **isotope biogeochemist**. My research activity has focused on developing isotopic methodologies to quantify the fluxes of Carbon involved in the **Global Carbon Cycle**. In the last years, I have produced records of atmospheric carbon-containing molecules, that have a very important role in altering the climate. I have focused on past changes of atmospheric greenhouse gases during the last centuries and millennia.

During my PhD, I focused on how to measure the fluxes of carbon involved in the **leaf litter decomposition** process, both at the ecosystem and at the molecular level. The scientific community is interested in how terrestrial ecosystems can incorporate CO₂ from the atmosphere and stabilise carbon in organic molecules. The results of my PhD studies have resulted in 3 publications: Rubino et al. (2007) on *Oecologia* (A9), Rubino et al. (2009) on *Environmental Chemistry Letters* (A10) and Rubino et al. (2010) on *Soil Biology & Biochemistry* (A11).

At the same time, I collaborated on projects developed by the research group I was working with at the Second University of Naples by measuring the $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ of organic and inorganic samples, from a number of Italian environmental and archaeological experimental sites. I carried out ^{14}C measurements by AMS (Accelerator Mass Spectrometry) at CIRCE (Centre for Isotopic Research on Cultural and Environmental heritage, Caserta, Italy). The results of those collaborations have produced 10 publications on international journals (A1-A8, A14 e A29) and 4 papers on conference proceedings (B1-B4), for which I am one of the co-authors.

During my post-doc in France, I focused on a specific class of compounds of soil organic matter: amino acids. I tested a methodology to **measure the $\delta^{13}\text{C}$ of soil amino acids**. The results from that study are described in a paper (A20) published on *Isotopes in Environmental and Health Science* (Rubino et al., 2014).

More recently, I have been working on a project whose objective is to better constrain the past variations of **carbon fluxes between the atmosphere, the ocean and the terrestrial biosphere**. We use ice cores and firn air archives to reconstruct the concentration and isotopic composition of trace gases in the past. I participated at the field season in Greenland in 2009 (NEEM2009). The NEEM (North Greenland Eemian Ice Drilling) project has gathered together scientists from 14 different countries and has resulted in a major publication on **Nature** (A15). Together with the researchers from ANSTO (Australian Nuclear Science and Technology Organization), I have produced a dataset of $^{14}\text{CO}_2$ of Greenland firn air (the air sampled from the shallowest part of a glacier). This dataset has been used for calibration of models estimating the age of firn air (A12, A16). I have helped producing a new CO₂ record from WAIS (West Antarctica Ice Sheet, A13) and developing a new extraction line for CO₂ and $\delta^{13}\text{CO}_2$ at the University of Copenhagen (A23). I have produced a new record of CO₂ and $\delta^{13}\text{CO}_2$ in air extracted from Law Dome (East Antarctica) and have used a Double Deconvolution model to estimate CO₂ fluxes between atmosphere, land and ocean over the last 1000 years (Rubino et al., 2013, A17). The records of CO₂ (as well as CH₄ and N₂O) and $\delta^{13}\text{CO}_2$ I have produced have been used as atmospheric forcing by the Coupled Model Intercomparison Project (CMIP, A26, A28 and A30). This is the major international modelling community providing results to the Intergovernmental Panel on Climate Change for future projection. I have written a review describing biomass burning proxies in ice cores (Rubino et al., 2016, A21). I have produced measurements of CO₂ and $\delta^{13}\text{CO}_2$ over the Late Holocene Pre-Industrial and associate those measurements with model interpretation of COS (carbonyl sulphide, tracer of photosynthesis) to attribute the causes of CO₂ variations during the Little Ice Age (1400-1800). These breakthrough results are described in a publication on **Nature Geoscience** (Rubino et al., 2016, A22). Just recently, I have developed the chronology of an outcropping blue ice area in Antarctica (Patriot Hills, Turney et al., 2013, A18, Fogwill et al., 2017, A25) and I have developed a database to update all greenhouse gas records from the ice core site of Law Dome (Antarctica, A30). I am currently collaborating with a number of international research groups and writing several manuscripts and proposals describing technological developments to study past climate change, as well as the interpretation of them (C1-C3). My research experience has allowed me to write a proposal for an European Research Council Consolidator Grant which has made it to the interview stage of the evaluation process (requested budget €1,849,644), but has scored B ("meets some but not all the ERC criteria..."). This demonstrates the potential to get future funding.

Detailed survey of my research activity and achieved results

All my research activity focused on the development of isotopic methodologies for quantifying the fluxes involved in the global carbon cycle.

During the first part of my PhD, I focused on how to measure the fluxes of carbon involved in the leaf litter decomposition process. This was motivated by the need to understand the factor influencing soil organic carbon formation and quantify its variation in concentration over time. In some ecosystems, the majority of soil organic carbon is formed from leaf litter decomposition and both the quantity and the chemical composition of carbon moving from litter to soil are not clearly known.

I first built a vacuum line to extract CO_2 from air sample and achieved high precision measurements of CO_2 isotopic composition ($\sigma < 0.02 \text{ ‰}$ for $\delta^{13}\text{C}$, $\sigma < 0.05 \text{ ‰}$ for $\delta^{18}\text{O}$) through a systematic study of the dependence of the trapping efficiency on the main factors (pressure and flow rate and the shape of the CO_2 trap, figure 1). The results were published in 2005 on Journal of Mass Spectrometry (A2).

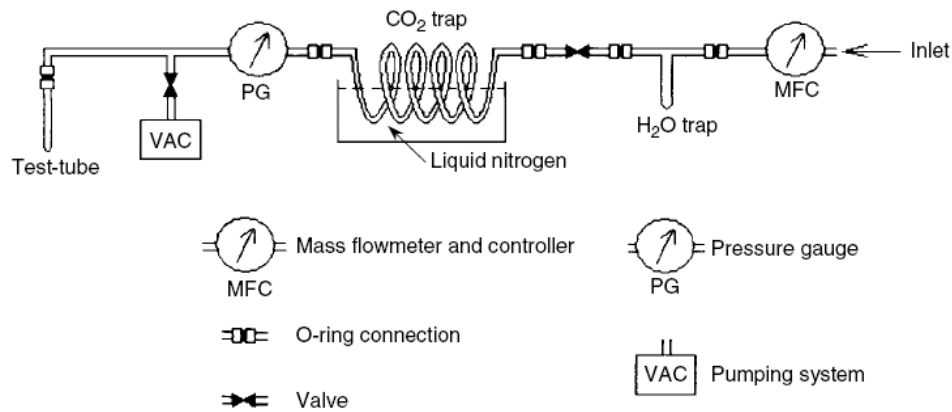


Figure 1: Vacuum line for extraction of CO_2 from air samples

Then, I focused on the quantification of carbon fluxes involved in litter decomposition. There are two major carbon fluxes: CO_2 respiration and formation of soil organic carbon. I planned an experiment where three isotopically labelled ($\delta^{13}\text{C} \sim -43 \text{ ‰}$) litter species of different quality were incubated in closed systems over a soil with a very different isotopic composition ($\delta^{13}\text{C} \sim -17 \text{ ‰}$).

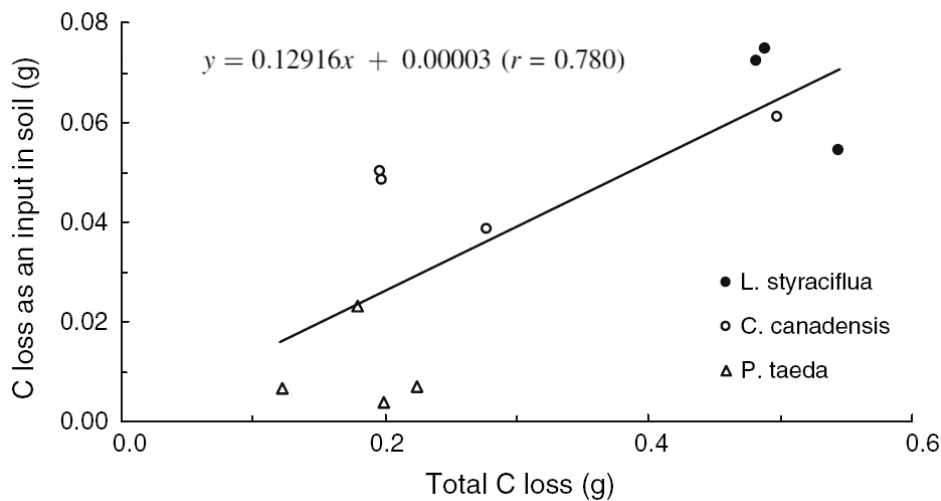


Figure 2: carbon loss by the litter as soil organic carbon as a function of total carbon loss by the litter

I close the carbon budget by measuring the litter mass loss over the incubation period (8 months), and quantifying the change in soil $\delta^{13}\text{C}$ and in $\delta^{13}\text{C}$ of the respired CO_2 . The results suggest that the percentage of carbon lost as CO_2 or as soil organic carbon do not depend on litter quality (figure 2 shows that the fraction of carbon lost by the litter in the soil is $13 \pm 2\%$ independently of the litter species). The results have been published in 2007 in the journal *Oecologia* (A9).

Then I measured the $\delta^{13}\text{C}$ of the major classes of soil organic carbon molecules at the Max Planck Institute for Biogeochemistry (Jena, Germany) to understand which soil organic carbon molecules preferentially incorporated litter-derived carbon. I focused on: PLFA (PhosphoLipids Fatty Acids) to understand which group(s) of microorganisms was active in incorporating litter-derived carbon; n-alkanes (considered to be very recalcitrant to microbial degradation) to quantify direct litter-derived carbon assimilation by soil (no role of micro-organisms); humic acid-derived molecules produced by soil pyrolysis. The technique used to measure the $\delta^{13}\text{C}$ of the molecules extracted from soil was Compound Specific Isotopic Analysis which couples gas-chromatograph (GC) with an Isotope Ratio Mass Spectrometry (IRMS) through Combustion (GC-C-IRMS). The results suggested that fungi are the group of microorganisms incorporating most of litter-derived carbon (figure 3). However, litter derived-C has been found also in compounds analysed through soil pyrolysis and in n-alkanes (figure 4). The results have been published in 2009 on *Environmental Chemistry Letters* (A10).

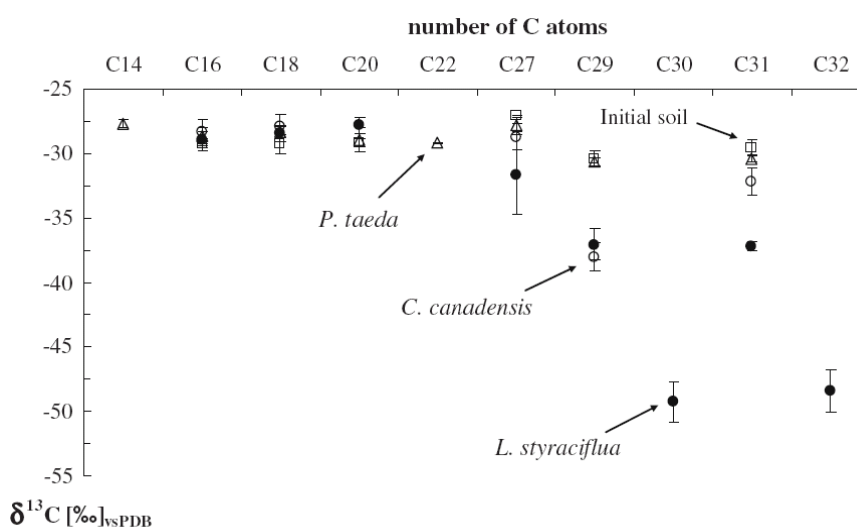


Figure 4: $\delta^{13}\text{C}$ of n-alkanes for the initial soil (squares) and for soils incubated with *L. styraciflua* (filled circles), with *C. canadensis* (white circles) and with *P. taeda* (triangles).

During my PhD, I have also carried out a field experiment to measure carbon fluxes during litter decomposition. In the past, litter decomposition field experiments have usually been carried out by using nets called "litterbags" to contain the litter samples and avoid contamination from fresh litter. Since litterbags stop the fragmented pieces of litter from falling underground (and being decomposed at a different rate) and alter the fractions of soil organic carbon formed from the litter, I put my litter samples in collars covered by a 1 cm^2 mesh net. The experiment has been carried out at the POPFACE (POPlar Free Air Carbon Enrichment, Tuscania, Viterbo) experimental site. Here, a poplar plantation had been kept under continuous CO_2 fumigation to understand how the terrestrial ecosystem will react to future conditions of atmospheric CO_2 concentration. The soil of the site was under nitrogen fertilization. We could then test the influence of those factors (CO_2 fumigation and nitrogen fertilization) on the fractions of carbon lost by the litter. As for the incubation experiment, I used ^{13}C -labelled litter samples.

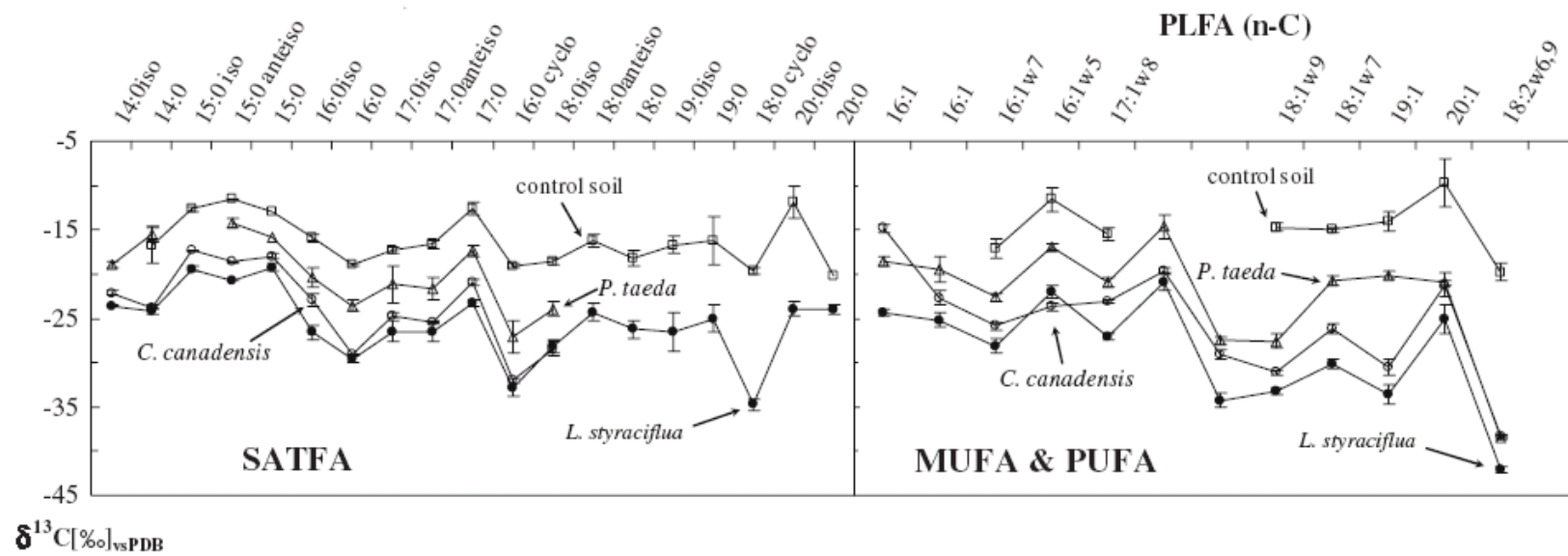


Figure 3: $\delta^{13}\text{C}$ of SATFA (Saturated Fatty Acid, left plot), MUFA (MonoUnsaturated Fatty Acids, right plot) and PUFA (PolyUnsaturated Fatty Acid, 18:2x6, right plot) for control soil (squares) and for soil incubated with *L. styraciflua* (filled circles), with *C. canadensis* (open circles) and with *P. taeda* (triangles).

My litter samples were extremely ^{13}C -enriched (+170 ‰) compare to the soil. I was able to close the carbon budget by measuring the mass loss over the incubation period (8 months), the change in the soil $\delta^{13}\text{C}$ and in the quantity and $\delta^{13}\text{C}$ of the respired CO_2 . The results suggest that the fractions of carbon lost by the litter are not dependent on either the CO_2 fumigation or the nitrogen fertilization (table 1). Additionally, litterbags were found to cause an underestimate of the amount of carbon lost by the litter (and they also not allow the quantification of the fraction of carbon lost in the soil organic matter). The results have been published in 2010 on Soil Biology and Biochemistry (A11).

	C_{input} (g)	C-CO_2 (g)	C_{input} (% of total C loss)	C-CO_2 (% of total C loss)	C-CO_2 (% of initial mass)	$\text{C}_{\text{input}}/\text{C-CO}_2$ ratio
FF	2.0 (1.1)	1.3 (0.2)	64 (35)	40 (7)	13.5 (2.5)	1.6 (0.5)
FN	2.1 (0.3)	1.2 (0.1)	65 (3)	37 (7)	12.5 (1.3)	1.8 (0.2)
NF	1.6 (0.4)	0.6 (0.1)	46 (7)	18 (4)	6.8 (1.3)	2.5 (0.4)
NN	2.0 (1.0)	0.8 (0.4)	64 (29)	29 (18)	9.0 (4.5)	2.2 (1.1)

Table 1: amount (g) and fraction (%) of carbon lost by the litter as an input into the soil (C_{input}) and as CO_2 for each one of the combination of factors (FF: fumigated-fertilized; FN: fumigated-not fertilized; F: not fumigated-fertilized; NN: not fumigated-not fertilized). The fractions are expressed as percentages over the total carbon lost by the litter.

At the end of my PhD, I visited the School of Chemistry (University of Bristol, UK) to measure the $\delta^{13}\text{C}$ of fatty acids extracted from my field experiment soil samples. The aim was to answer the question of the influence of CO_2 fumigation and nitrogen fertilization on soil microbial community. The results suggested the CO_2 fumigation and the nitrogen fertilization did not have any significant influence on the activity of the soil microbial community. These results are included in the article on Soil Biology and Biochemistry (A11).

During my PhD, I was also involved in measurements of archaeological samples. I have for instance measured the $\delta^{13}\text{C}$ and the $\delta^{15}\text{N}$ of organic samples extracted from archaeological remains from different Italian sites to investigate the diet of ancient populations (paleo-diet). This can give important information about the socio-economic characteristic of the populations under investigation. The archaeological samples were dated by ^{14}C dating with AMS (Accelerator Mass Spectrometry) at CIRCE (Centre for Isotopic Research on Cultural and Environmental heritage). I helped with the assembly and operation of the AMS system for the ^{14}C measurements. The results of those collaborations have produced 9 publications on international journals (A1-A8, A14) and 4 articles on conference proceedings (B1-B4).

In 2007, I started a research project at the INRA (Institut National de la Recherche Agronomique) in Aix en Provence (France). The objective was to develop a method to measure the $\delta^{13}\text{C}$ of soil amino acids. The project was part of a collaboration (DYNAMOS) between a number of laboratories of the French scientific community aiming at measuring the residence time of the major classes of soil organic compounds (lignin, polysaccharides, lipids, etc...). The measurement of soil amino acids $\delta^{13}\text{C}$ is problematic because of the polar properties of amino acids which make them difficult to analyse through gas-chromatography. We managed to develop a relatively cheap and simple technique (A20, Figure 7).

In October 2008, I started a post-doc at the Centre for Ice and Climate (CIC, Niels Bohr Institute, University of Copenhagen) working on a project in collaboration with the CSIRO (Commonwealth Scientific and Industrial Research Organisation, Aspendale, Melbourne, Australia) Marine and Atmospheric Research. The project focused on measuring the concentration and isotopic composition of major greenhouse gases (CO_2 , CH_4 , N_2O , CO , $\delta^{13}\text{C-CO}_2$ et $\delta^{18}\text{O-CO}_2$) trapped in ice cores samples in Greenland and Antarctica. I have produced a new record of CO_2 concentration and $\delta^{13}\text{CO}_2$ for the air extracted from Antarctic ice (figure 8). I have achieved higher temporal resolution than past records

during the industrial period, have revised the old measurements covering the pre-industrial and have interpreted temporal change of CO_2 concentration in terms of exchanges of CO_2 between the atmosphere, the terrestrial biosphere and the ocean through a Kalman Filter Double Deconvolution (KFDD, A17).

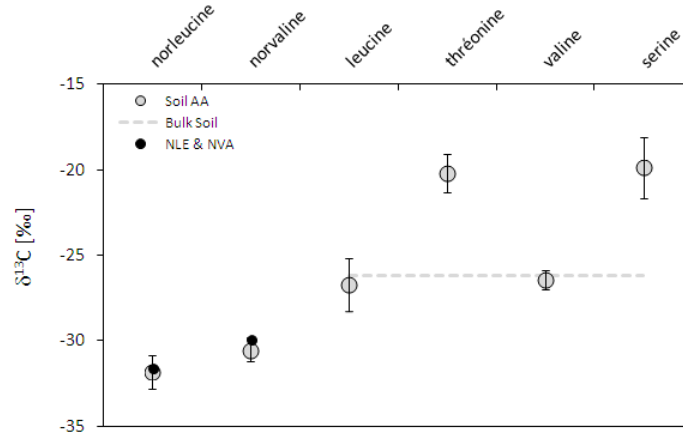


Figure 7: $\delta^{13}\text{C}$ calculated from TMS derivatives for amino acids extracted from soil are in light grey. The dashed line is the $\delta^{13}\text{C}$ of the bulk soil. The $\delta^{13}\text{C}$ calculated from TMS derivatives for NLE and NVA added to the soil before extraction are compared to their reference values (black circles). Dashed line is for the $\delta^{13}\text{C}$ of total soil organic carbon (bulk soil).

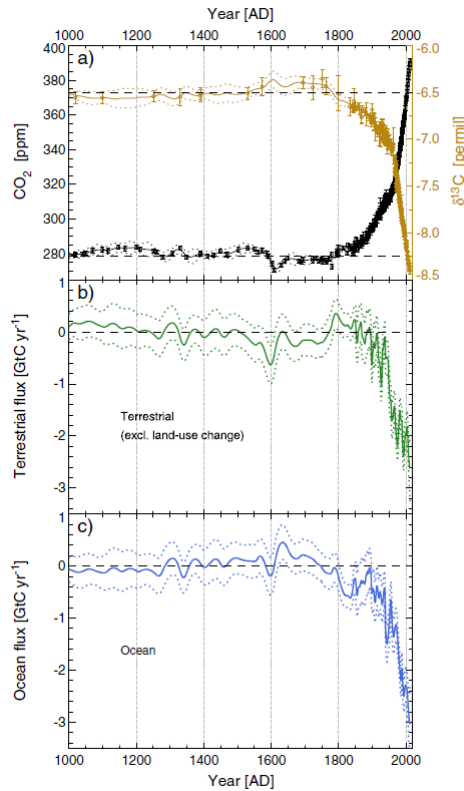


Figure 8: CO_2 The new records between 1000 and 2012 A.D.: (a) CO_2 concentration (black circles) and the $\delta^{13}\text{C}$ (brown circles); solid lines are results of the double deconvolution for, respectively, (b) the atmosphere-terrestrial biosphere and (c) the atmosphere-ocean CO_2 flux. Error bars are analytical uncertainties when the analytical uncertainty was larger than the minimum uncertainty (1.2 ppm and

0.05 ‰) as described in the text (section 3.1). Dashed lines show the 1σ uncertainty associated to the KFDD

The NEEM project is an international project for deep ice drilling in Greenland (North Greenland Eemian ice drilling). The main focus was to obtain an accurate record of the last glacial period (the Eemian, 130.000-110.000 years before present). The results have led to a very important publication on the journal Nature (A15, figure 9).

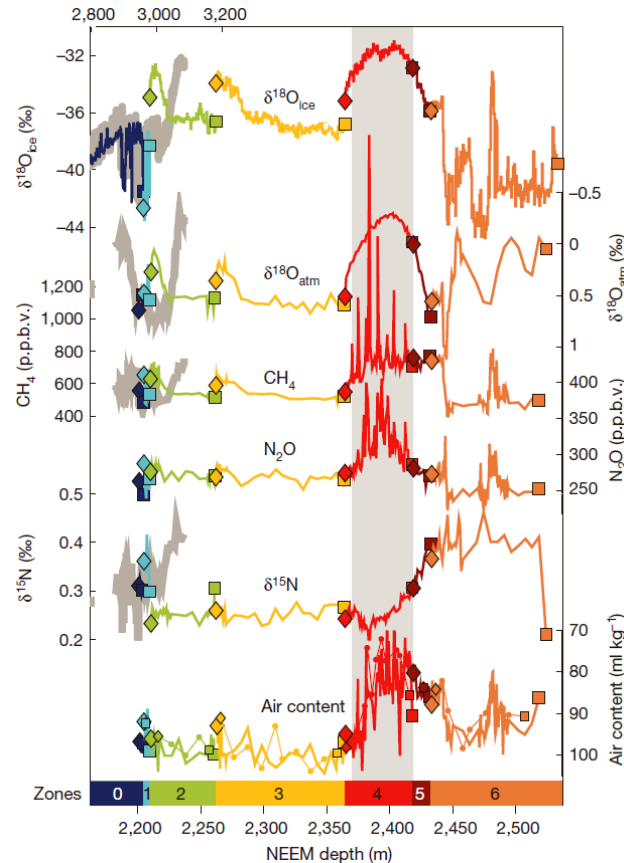


Figure 9: The observed records of $\delta^{18}\text{O}_{\text{ice}}$, $\delta^{18}\text{O}_{\text{atm}}$ (reversed scale), CH_4 , N_2O , $\delta^{15}\text{N}$ and air content (reversed scale) from 2,162m and deeper are plotted on the NEEM depth scale (bottom x axis).

I have participated in the field season during the summer 2009, collaborating on the fir air sampling (the firn is the shallowest part of the glacier, where snow is compacted and transformed into ice). The samples taken during the 2009 field season have been analysed for $^{14}\text{CO}_2$ at ANSTO (Australian Nuclear Science and Technology Organization). The results have given important information on the age of the air in the firn and have been published in two papers (A12 and A16) describing the models used to constrain the age of the air in the firn.

After publishing an invited review about "Ice core records of biomass burning" on a special issue of The Anthropocene Reviews (A21), I have focused on a record of CO_2 and $\delta^{13}\text{CO}_2$ over the Late Holocene Pre-Industrial (Figure 10) to attribute the causes of significant variations of greenhouse gases during the Little Ice Age - LIA, approximately 1400-1800 AD). I have developed a simple, global simulation of atmospheric carbonyl sulphide (COS) to show that the LIA low CO_2 concentration was caused by temperature (and not by forest re-growth, as state by the Early Anthropogenic Hypothesis). The breakthrough results of this study are published on Nature Geoscience (A22).

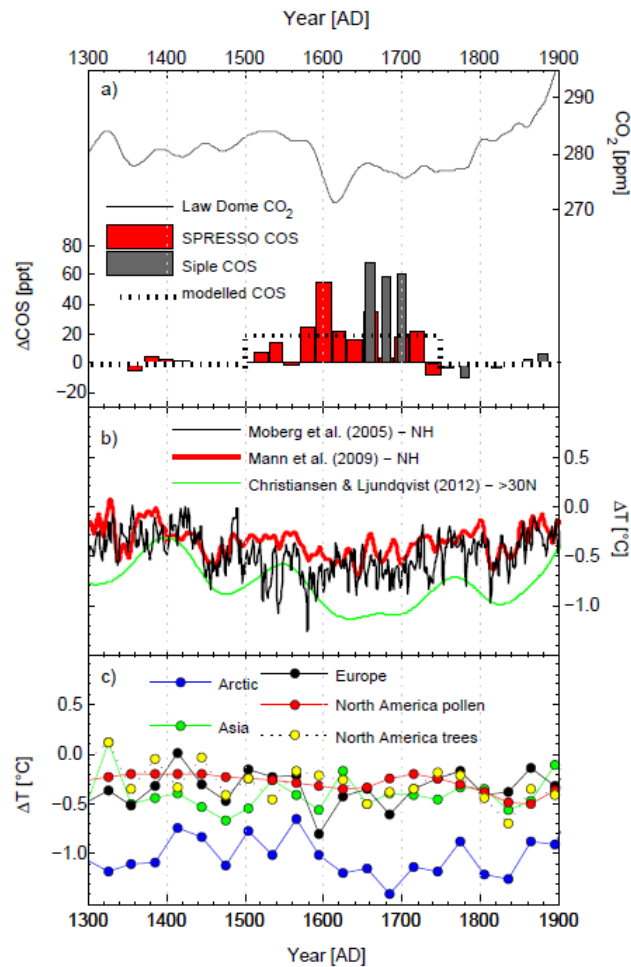


Figure 10: Records of CO₂ and δ¹³CO₂, and simulation of COS over the last 700 years

I have helped produce a new CO₂ record from WAIS (West Antarctica Ice Sheet, A13) and develop a new extraction line for CO₂ and δ¹³CO₂ at the University of Copenhagen (A23). I have collaborated at a project on quantifying the sources of nitrates pollution in the Po' valley (Italy, A24). Very recently, I have developed the chronology for the Patriot Hills horizontal ice core in Antarctica (A25). I have also helped with isotopic measurements for archaeological applications (A29).

My records of CO₂ (as well as CH₄ and N₂O) and δ¹³CO₂ have been used as atmospheric forcing by the Coupled Model Intercomparison Project (CMIP, A26, A28 and A30) which is the major international modelling community providing results to the Intergovernmental Panel on Climate Change. Specifically, I have developed a database to update the records of greenhouse gases from Law Dome (Antarctica, A30, figure 11)

Currently, I am collaborating on several projects and writing a number of manuscripts describing laboratory developments (C2), as well as studies of past climate change (C1 and C3).

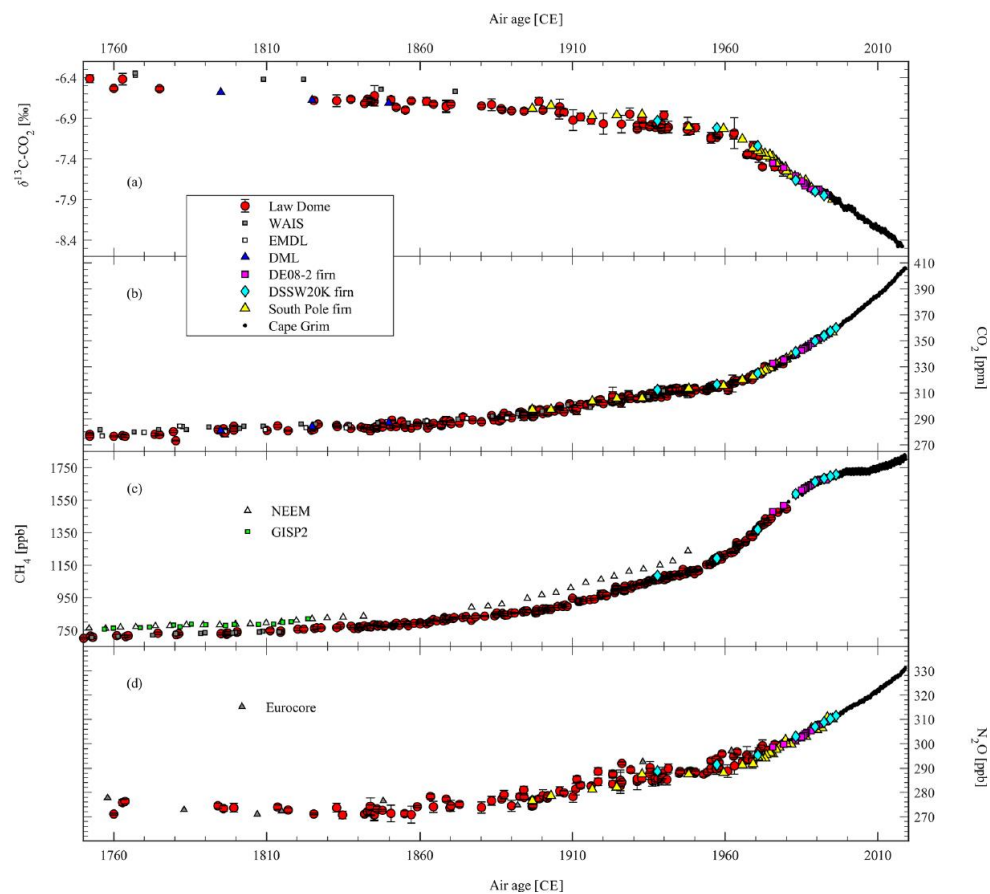


Figure 11: Updated records of greenhouse gases from Law Dome over the Industrial Period (A30)