



International early-career workshop

Microbes at the Interface of Land-Atmosphere Feedbacks

13-17 October 2014

Les Jardins de Ste. Maxime Hotel
Sainte-Maxime, France

RAINS

Research on Airborne Ice Nucleating Species

With permission: edmell1@cox.net

Participants

RAINS PIs

MILAF organizers

MORRIS Cindy	Senior Research Scientist, Plant Pathology Research Unit, INRA, Montfavet, France; Affiliate Prof. Plant Sciences & Plant Pathology Dept., Montana State Univ. – Bozeman
SANDS David	Professor, Plant Sciences & Plant Pathology Dept, Montana State Univ. - Bozeman

other PIs

CHRISTNER Brent	Associate Professor, Department of Biological Sci., Louisiana State Univ., Baton Rouge
VINATZER Boris	Associate Professor, Plant Pathology, Physiology & Weed Science Department, Virginia Tech, Blacksburg, Virginia
SCHMALE David	Associate Professor, Plant Pathology, Physiology and Weed Science, Virginia Tech, Blacksburg, Virginia

External mentors

BRUMMER E. Charles	Director, Plant Breeding Center and Professor, Plant Sciences Dept. Univ. California, Davis
CONEN Franz	Research Scientist, Environmental Sciences, University of Basel, Switzerland
BRUNET Yves	Senior Research Scientist, ISPA Research Unit, INRA, Bordeaux, France

Stakeholders

METRO Nicolas	Founder and CEO of Kinomé, France ; Founder of the Forest&Life movement, international
COHEN Jane	Edward Clark Centennial Professor of Law at the University of Texas School of Law
LEGALL Olivier	Deputy Director General, INRA, Paris, France

Early career scientists

AMATO Pierre	Research Scientist, Institute of Chemistry of Clermont-Ferrand (CNRS), Aubière, France
CAROTENUTO Federico	PhD student, Biological Sciences (Ecology), University of Innsbruck, Austria & Fondazione Edmund Mach, San Michele all'Adige, Italy
CARR Christopher	Research Scientist, MIT Department of Earth, Atmospheric and Planetary Sciences, Cambridge, MA, USA and Research Fellow, Massachusetts General Hospital Department of Molecular Biology, Boston, MA, USA
CREAMEAN Jessie	National Research Council postdoctoral associate, NOAA Earth System Research Laboratory, Boulder, CO, USA
DAVID Ray	PhD student, Civil and Environmental Engineering, Virginia Tech, Blacksburg, VA, USA
DELEON-RODRIGUEZ Natasha	PhD. Candidate, School of Biology, Georgia Institute of Technology, Atlanta, GA
DUEKER Elias	Postdoctoral Researcher, CUNY Queens College, Flushing, NY; Assistant Professor, Environmental and Urban Studies, Bard College, Annandale-on-Hudson, NY
FELGITSCH Laura	University Assistant and PhD Student, Institute of Materials Chemistry, Workgroup of Prof. Hinrich Grothe, Vienna University of Technology, Vienna, Austria
IRISH Vickie	PhD student, Chemistry, University of British Columbia
MONTEIL Caroline	Post Doc researcher, Ecology and Epidemiology of plant diseases, University of Swansea, Wales, UK
PIETSCH Renee	PhD student, Biological Science, Virginia Tech, Blacksburg, VA, USA
SANTL TEMKIV Tina	PostDoc reseracher, Stellar Astrophysics Centre, Aarhus University, Denmark
STOPELLI Emiliano	Ph.D. student, Dept. Environmental Geosciences, University of Basel, Switzerland
THOMSON Erik	Research Scientist, Department of Chemistry and Molecular Biology – Atmospheric Science, University of Gothenburg, Gothenburg, Sweden













Program















	start	end	
13/10/14	16:00		<i>participants can check into rooms</i>
	18:30	19:30	<i>welcome reception</i>
	19:30	21:00	<i>dinner</i>
14/10/14	07:00	08:30	<i>breakfast</i>
	Frames of reference: orchestrated discussions based on readings		
	08:30	09:30	Biology and ecology of microorganisms, spores & pollen relative to sources for aerosols (discussion leaders: Morris)
	09:30	10:30	Size, chemistry and other properties of microorganisms relative to detection of aerosols (discussion leaders: Schmale & Vinatzer)
	10:30	10:45	<i>pause</i>
	10:45	11:45	Atmospheric fluxes: definition and measurement (discussion leader: Brunet)
	11:45	12:45	Plants and landscapes and how humans modify them (discussion leaders: Sands & Brummer)
	12:45	14:00	<i>lunch</i>
	14:00	14:45	Ice nucleation: measurement and impact on atmospheric processes (discussion leader: Conen)
	14:45	15:30	Water budget of Earth and tracing the water cycle (discussion leader: Christner)
	15h30	16:00	Modeling atmospheric processes (discussion leader: Brunet)
	16:00	16:45	Creativity free-for-all (leader: Sands)
	16:45	17:00	general discussion
	17:00	19:00	<i>free time</i>
	19:00	20:30	<i>dinner</i>
15/10/14	07:00	08:30	<i>breakfast</i>
	Tools		
	08:30	08:45	Introduction to the activity for this session Break out into working groups (3-4 early career scientists / group) to answer the question: If you could make a new tool for this research, what would the tool do, what is existing knowledge on which it is based, and what do we need to discover (research) to create the tool? Tea at 10h30 on terrace
	08:45	10:30	work in groups
	10:30	10:40	<i>transition time</i>
	10:40	10:50	presentation, Group 1
	10:50	11:00	presentation, Group 2
	11:00	11:10	presentation, Group 3
	11:10	11:20	presentation, Group 4
	11:20	11:50	General Discussion


Grand Challenges			
	11:50	12:05	Introduction to the activity for this session Break out into working groups (3-4 early career scientists / group; different composition than previous activity) to formulate projects: If you could put together any project on the subject of the workshop, what question would you address, what problem would you try to solve?
	12:05	12:30	start working in groups to design project and prepare presentation
	12:30	14:00	<i>lunch (adapted to allow people to continue working)</i>
	14:00	15:00	Continue working in groups
	15:00	15:15	Presentation, Group 1
	15:15	15:30	presentation, Group 2
	15:30	15:45	presentation, Group 3
	15:45	16:00	presentation, Group 4
	16:00	17:00	General Discussion
	17:00	19:00	<i>free time</i>
	19:00	20:30	<i>dinner</i>
	“Getting to know you”: Presentation of professional activities (5 min presentation, 5 min discussion)		
	20:40	20:50	AMATO Pierre
	20:50	21:00	FELGITSCH Laura
	21:00	21:10	DELEON Natasha
	21:10	21:20	CREAMEAN Jessie
	21:20	21:30	DAVID Ray
	21:30	21:40	DUEKER Elias
	21:40	21:50	MONTEIL Caroline
	21:50	22:00	CAROTENUTO Federico
	22:00	22:10	IRISH Vicky
16/10/14	07:00	08:30	<i>breakfast</i>
	Partners, stakeholders, science-society interface: presentations and discussions		
	08:30	10:00	Changing landscapes to influence ecosystem services & human well-being (N. Métró)
	10:00	10:15	<i>pause</i>
	10:15	11:45	Water rights (J. Cohen)
	11:45	12:30	The future of science: working with teams and with stakeholders, to answer complex questions, to solve problems of socio-economic and political importance in a world of open-access science (discussion leader: Morris)
			Announce afternoon activity concerning team building/interdisciplinarity: Break out into same working groups as for activity 2 to revise projects. If you could build any team, who would you include and how would it modify the Grand Challenge project that you proposed in the last session? ALTERNATIVE: Think about all of the stakeholders, specifically, how they could be integrated into the ensemble of our projects, we will put them together. Announce preparation for tomorrow’s presentations: -20 min presentation: What environmental and societal problems can we tackle in the next decade – in light of the interdisciplinarity available for deployment and the technology to come?: Assign to 4 participants -Individual presentations, 1-2 min each: What questions do I hope to have answered (in an ideal world) in the next 5 years and what will be the impediments to this – focusing on infrastructure and organization of research moreso than on technological limits
	12:30	14:00	<i>lunch</i>

	Team building		
	14:00	15:30	work in groups for activities announced above
	15:30	15:40	presentation, Group 1
	15:40	15:50	presentation, Group 2
	15:50	16:00	presentation, Group 3
	16:00	16:10	presentation, Group 4
	16:10	16:50	General Discussion
	16:50	17:00	Reminder of the activity for tomorrow morning (announced above)
	17:00	19:00	<i>free time</i>
	19:00	20:30	<i>dinner</i>
	“Getting to know you”: Presentation of professional activities (5 min presentation, 5 min discussion)		
	20:40	20:50	CARR Christopher
	20:50	21:00	PIETSCH Renee
	21:00	21:10	SANTL TEMKIV
	21:10	21:20	STOPELLI Emiliano
	21:20	21:30	THOMSON Eric
17/10/14	07:00	09:00	breakfast and check out of rooms
	Trajectories of a scientist: Your future in an ideal world, obstacles in a real world and how to overcome them		
8:30	09:00	09:20	What environmental and societal problems can we tackle in the future? (presented by 4 nominated participants)
	09:20	09:25	Introduction to the activity (reminder from yesterday)
			Individual visions of future
	09:25	09:30	AMATO Pierre
	09:30	09:35	CAROTENUTO Federico
	09:35	09:40	CARR Christopher
	09:40	09:45	CREAMEAN Jessie
	09:45	09:50	DAVID Ray
	09:50	09:55	DELEON Natasha
	09:55	10:00	DUEKER Elias
	10:00	10:05	FELGITSCH Laura
	10:05	10:10	IRISH Vickie
	10:10	10:15	MONTEIL Caroline
	10:15	10:20	PIETSCH Renee
	10:20	10:25	SANTL TEMKIV
	10:25	10:30	STOPELLI Emiliano
	10:30	10:35	THOMSON Eric
	10:35	10:45	Discussion
			<i>(coffee and tea will be available as of 10:00)</i>
	10:45	11:45	O. LeGall: The power of research institutes to facilitate the ideal world vision of young, creative scientists to foster innovation, scientific progress on complex subjects and practical applications.
	11:45	12:15	Maintaining our network / ideas for post-workshop interactions (discussion leader: Morris)
	12:15	12:30	General discussion and closing of workshop
	12:30	14:00	<i>lunch</i>
			<i>Departures</i>

Reading list

 Papers marked with a drop are of particular significance for the workshop	
THE LINK OF BIOLOGY TO THE WATER CYCLE	
	Morris, C. E., F. Conen, J. A. Huffman, V. Phillips, U. Poeschl, and D. C. Sands. 2014a. Bioprecipitation: A feedback cycle linking Earth history, ecosystem dynamics and land use through biological ice nucleators in the atmosphere. <i>Global Change Biol.</i> 20:341-351.
	Michaelian, K. 2012. Biological catalysis of the hydrological cycle: life's thermodynamic function. <i>Hydrol. Earth Syst. Sci.</i> 16:2629–2645
LANDSCAPES, PLANT GENETIC RESOURCES, ECONOMICS	
	Brummer, E. C., W. T. Barber, S. M. Collier, T. S. Cox, R. Johnson, S. C. Murray, R. T. Olsen, R. C. Pratt, and A. M. Thro. 2011. Plant breeding for harmony between agriculture and the environment. <i>Frontiers in Ecology and the Environment</i> 9:561-568.
	Ellis et al 2010. Anthropogenic transformation of the biomes, 1700 to 2000. <i>Global Ecology and Biogeography</i> 19:589-606
	Mahmood, et al. 2014. Land cover changes and their biogeophysical effects on climate. <i>International Journal of Climatology</i> 34:929-953.
	Peterson, J.M. 2014. Economic linkages to changing landscapes. <i>Environmental Management</i> 53:55-66
INTERACTION AEROSOLS-ATMOSPHERE-CLIMATE	
	Kanitz, T., P. Seifert, A. Ansmann, R. Engelmann, D. Althausen, C. Casiccia, and E. G. Rohwer. 2011. Contrasting the impact of aerosols at northern and southern midlatitudes on heterogeneous ice formation. <i>Geophysical Research Letters</i> 38:L17802.
	Kanakidou, M. 2014. Atmospheric Aerosols and Climate Impacts (Chapter 8), p 181-206. In I. Colbeck and M. Lazaridis (ed.), <i>Aerosol Science: Technology and Applications</i> . John Wiley & Sons, Ltd.
PLANT MICROBIOLOGY	
	Morris, C. E., C. L. Monteil, and O. Berge. 2013. The life history of <i>Pseudomonas syringae</i> : linking agriculture to Earth system processes. <i>Annu. Rev. Phytopathol.</i> 51:85-104.
	Morris C.E. 2001. Phyllosphere. In: <i>Encyclopedia of Life Sciences</i> , Nature Publishing Group, London, http://www.els.net
	Vorholt, J. A. 2012. Microbial life in the phyllosphere. <i>Nat Rev Micro</i> 10:828-840.
AEROSOL AND FLUXES	
	Morris, C. E., C. Leyronas, and P. C. Nicot. 2014b. Movement of Bioaerosols in the Atmosphere and the Consequences for Climate and Microbial Evolution (Chapter 16), p. 393-416. In I. Colbeck and M. Lazaridis (ed.), <i>Aerosol Science: Technology and Applications</i> . John Wiley & Sons, Ltd.
	Tallapragada, P., S. D. Ross, and D. G. Schmale III. 2011. Lagrangian coherent structures are associated with fluctuations in airborne microbial populations. <i>Chaos: An Interdisciplinary Journal of Nonlinear Science</i> 21:033122.
	Sundberg, S. 2013. Spore rain in relation to regional sources and beyond. <i>Ecography</i> 36:364-373.
	Wilkinson, D. M., S. Koumoutsaris, E. A. D. Mitchell, and I. Bey. 2011. Modelling the effect of size on the aerial dispersal of microorganisms. <i>J. Biogeog.</i> 39:89-97.
DISSEMINATION, SOURCES	
	Christner, B. C., C. Rongman, C. E. Morris, K. S. McCarter, C. M. Foreman, M. L. Skidmore, S. N. Montross, and D. C. Sands. 2008a. Geographic location, season, and precipitation chemistry influence on the abundance and activity of biological ice nucleators in rain and snow. <i>Proc. Nat. Acad. Sci.</i> 105:18854–18859. (supporting info in Christner-2008b)

	Monteil, C. L., M. Bardin, and C. E. Morris. 2014. Features of air masses associated with the deposition of <i>Pseudomonas syringae</i> and <i>Botrytis cinerea</i> by rain and snowfall. <i>ISME J Advanced Online Version</i> (10 April 2014) doi:10.1038/ismej.2014.55.
BIOLOGICAL ICE NUCLEATORS	
	Conen, F., C. E. Morris, J. Leifeld, M. V. Yakutin, and C. Alewell. 2011. Biological residues define the ice nucleation properties of soil dust. <i>Atmos. Chem. Phys.</i> 11:9643-9648 doi:10.5194/acp-11-9643-2011, 2011.
	O'Sullivan, D., B. J. Murray, T. L. Malkin, T. F. Whale, N. S. Umo, J. D. Atkinson, H. C. Price, K. J. Baustian, J. Browse, and M. E. Webb. 2014. Ice nucleation by fertile soil dusts: relative importance of mineral and biogenic components. <i>Atmos. Chem. Phys.</i> 14:1853-1867.
	Murray, B. J., D. O'Sullivan, J. D. Atkinson, and M. E. Webb. 2012. Ice nucleation by particles immersed in supercooled cloud droplets. <i>Chemical Society Reviews</i> 41:6519-6554.
	Hader, J.D. et al 2014. Contribution of pollen to atmospheric ice nuclei concentrations. <i>Atmos. Chem. Phys.</i> 11:5433-5449.
	Garnham, C. P., R. L. Campbell, V. K. Walker, and P. L. Davies. 2011. Novel dimeric β -helical model of an ice nucleation protein with bridged active sites. <i>BCM Structural Biology</i> 11:36 (http://www.biomedcentral.com/1472-6807/11/36).
ICE NUCLEATION, principles	
	Vali, G. 2014. Interpretation of freezing nucleation experiments: singular and stochastic; sites and surfaces, <i>Atmos. Chem. Phys.</i> 14, 5271-5294, doi:10.5194/acp-14-5271-2014
WATER BUDGET	
	Ellison, D. et al. 2012. On the forest cover–water yield debate: from demand- to supply-side thinking. <i>Global Change Biology</i> 18:806–820
	Cohen, J. M. 2012. Are we killing the rain? Meditations on the water cycle and, more particularly, on bioprecipitation. <i>Water International</i> DOI:10.1080/02508060.2012.706200.
GEOENGINEERING, SCIENCE-SOCIETY INTERACTIONS	
	Sweeney, J.A. 2014. Command-and-control: Alternative futures of geoengineering in an age of global weirding. <i>Futures</i> 57: 1-13 doi.org/10.1016/j.futures.2013.12.00
INTERDISCIPLINARY RESEARCH	
	Lyall, C., Meagher, L.R. 2012. A Masterclass in interdisciplinarity: Research into practice in training the next generation of interdisciplinary researchers. <i>Futures</i> 44:608-617.
	Goring, S.J. et al. 2014. Improving the culture of interdisciplinary collaboration in ecology by expanding measures of success. <i>Front Ecol Environ</i> 2014; 12(1): 39–47, doi:10.1890/120370
	Zucker, D. 2012. Developing your career in an age of team-science. <i>J Investig Med.</i> 60(5): 779–784. doi:10.231/JIM.0b013e3182508317
	Shaman, J. et al 2013. Fostering advances in interdisciplinary climate science. <i>PNAS</i> 110 (suppl 1):3653–3656. www.pnas.org/cgi/doi/10.1073/pnas.1301104110 (you can watch excerpts from the symposium linked to this paper: www.nasonline.org/climate-science.html)
THE FUTURE OF SCIENCE	
	Mausser, W. et al. 2013. Transdisciplinary global change research: the co-creation of knowledge for sustainability. <i>Current Opinion in Environmental Sustainability</i> 5:420–431
	Mauz, I. et al 2012. How scientific visions matter: insights from three long-term socio-ecological research (LTSER) platforms under construction in Europe. <i>Environmental Science and Policy</i> 19-20: 90-99
CREATIVITY	

	Sands, D. C. 1992. Rediscovering idea generation in a scientific discipline. <i>Plant Disease</i> 76:1079-1080.
MODELS	
	Rosenblueth, A., Wiener, N. 1945. The role of models in science. <i>Philosophy of Science</i> 12:316-321

RECOMMENDED VIDEOS:

Crop insurance against drought in Africa : https://www.ted.com/talks/rose_goslinga_crop_insurance_an_idea_worth_seeding

Grow a tiny forest anywhere : https://www.ted.com/talks/shubhendu_sharma_how_to_grow_a_tiny_forest_anywhere

Why clouds stay up : http://sciencealert.com.au/features/20140910-26309.html?utm_content=bufferf02c9&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer