

2007 Annual Report for RG 7.01.00
"Impacts of air pollutants and climate change on forest ecosystems"

In 2007, RG 7.01 strengthened research and communication by cooperating with several Institutions (COST, ICP Forests, Sylva-World, APGC, other IUFRO Units) in organizing meetings, publishing proceedings, and circulating information by web and email. Challenging issues for research and communication were defined. A special focus is on ozone. The emerging research needs about air pollution and climate change impacts on forests - from the 22nd RG 7.01 meeting "Forests under Anthropogenic Pressure – Effects of Air Pollution, Climate Change and Urban Development" (September 10-16, 2006, Riverside, CA, USA) – suggest tropospheric or ground-level ozone remains the main phytotoxic air pollutant and is also recognized as a significant greenhouse gas. Ozone is particularly relevant for the linkages between climate change and air pollution. Climate change, on the one hand, influences ozone concentrations through dynamical and chemical changes in the atmosphere. On the other hand, increasing background ozone concentrations affect climate change because ozone is a potent greenhouse gas itself and indirectly influences the lifetime of other greenhouse gases such as methane. In addition, surface ozone causes the most concern because of its phytotoxic potential. In North America, Europe, and Asia, incidence of high ozone concentrations is decreasing, but background levels are steadily rising. Current background ozone levels in the Northern Hemisphere have increased 2-4.5 times since pre-industrial times. Although many questions remain, we now know a great deal about how ozone affects forests at the cell/leaf level (by inducing a cascade of biochemical, physiological and morphological responses) and at the tree/canopy level (by affecting allocation and carbon strength, reproduction, hydrology, and the response to co-occurring stressors). The most significant ozone impact is on the regulatory capacity of resource allocation rather than on productivity. However, forest ecosystems are much complex. Gas exchange measurements carried out at steady state suggest ozone reduces stomatal conductance and thus increases protection from drought and additional ozone. Ozone, however, may impair stomatal control and predispose trees to drought stress under dynamic conditions, as those in forests. Ozone-induced increases in sap-flow have been shown to result in stem growth losses, depletion of soil moisture in the rooting zone, and reduced streamflow, with implications for all the forest hydrologic processes. In addition, species-specific and individual-specific responses to ozone affect forest competition and biodiversity. There is a need to scale from the cell and leaf level up to the ecosystem and regional level, and to develop a biologically significant and usable standard to protect forests from ozone. Further work is needed for understanding the cause/effect-based relationships between ozone and other stresses at the stand and ecosystem level. Modelling may provide new insights into ozone impacts on forests, even though scalar and conceptual uncertainties still limit the current understanding of basic physiological mechanisms. RG 7.01 has been working at defining the major challenges to the development of an air quality standard for ozone that has both biological significance and practicality in usage.

In addition, we expanded our strategic partnerships and co-operation by establishing a new WP which will help in bridging environmental science and policy, in particular in developing countries. Much effort was devoted to organize our 23rd Meeting for Specialists in Air Pollution and Climate Change Effects on Forest Ecosystems, to be held in Switzerland in 2008. A special thanks to the local organizer and WG 7.01.01 coordinator, Marcus Schaub.

More details are below.

1. Meetings

RG 7.01.00 has supported the organization of the following meetings:

- International Symposium "Bottlenecks, Solutions, and Priorities in the Context of Functions of Forest

Resources”, 17 - 19 October 2007, Istanbul, Turkey;

- COST Workshop “Forest Ecosystems in a Changing Environment: Identifying Future Monitoring and Research Needs”, 10 – 13 March 2008, Istanbul, Turkey <http://www.costforest2008.org/>;
- Conference "Forests, Bioenergy and Climate Change", 20 - 21 March 2008, Casablanca, Morocco <http://www.geocities.com/sylva.monde/first.htm?20088?200814>;
- 23rd Meeting for Specialists in Air Pollution and Climate Change Effects on Forest Ecosystems “Air Pollution and Climate Change at Contrasting Altitude and Latitude”, 7 - 12 September 2008, Muerten, Switzerland http://www.wsl.ch/iufro_ch_2008/index_EN?-C=&;
- APGC Symposium “Plant Functioning in a Changing Global Environment”, 7 – 11 December 2008, Creswick, Victoria, Australia <http://www.apgc.eu/Home>

2. Publications

Schaub M., Paoletti E. (Eds.): 2007, Special issue section: **Air pollution and Climate Change: A Global Overview of the Effects on Forest Vegetation**. Environmental Pollution, 147(3): 492-531. Joint proceedings for the verbal presentations within the sessions 116 “Ozone Exposures and Effects on Forest Vegetation: A global Overview” and 065 “Forests between Air Pollution and Climate Change”, IUFRO World Congress, August 2005, Brisbane, Australia.
http://www.sciencedirect.com/science?_ob=PublicationURL&_tokey=%23TOC%235917%232007%23998529996%23652855%23FLA%23&_cdi=5917&_pubType=J&_auth=y&_acct=C000044643&_version=1&_urlVersion=0&_userid=825107&md5=a792bb57d3d2dadcf55dbb5f6385a543

Paoletti E., Schaub M., Bytnerowicz A. (Eds.): 2007, Special Section, **Air Pollution and Climate Change: Key Studies of the Effects on Forest Vegetation**. Environmental Monitoring and Assessment, 128 (1-3): 1-131 .

Joint proceedings for the poster presentations within the sessions 116 “Ozone Exposures and Effects on Forest Vegetation: A global Overview” and 065 “Forests between Air Pollution and Climate Change”, IUFRO World Congress, August 2005, Brisbane, Australia.
<http://www.springerlink.com/content/m580431m3206/?p=51573684e47d46be81afa12c2c64260b&pi=0>

Bytnerowicz, A., Arbaugh, M., Fenn, M., Heath, R., Paoletti, E., Gimeno, B.S., (Eds.): 2007, **Forests under Influence of Air Pollution, Climate Change and Urban Development**.

TheScientificWorldJOURNAL, 7(S1): 266 pp.

Proceedings of the 22nd meeting for Specialists in Air Pollution Effects on Forest Ecosystems "Forests under Anthropogenic Pressure. Effects of Air Pollution, Climate Change and Urban Development", September 10-16, 2006, Riverside CA, USA.

<http://www.thescientificworld.com/SCIENTIFICWORLDJOURNAL/search/SearchResults.asp?jid=0&From=Main&Terms=impacts%20of%20air%20pollution>

Selected best papers were peer-reviewed and will be published in the international journal Environmental Pollution.

3. Changes in the RG Structure

A new WP was established in November, 2007. The new Unit 7.01.06 will deal with those "Social and political aspects" related to the "Impacts of air pollution and climate change on forest ecosystems" (RG 7.01.00).

Air Pollution/Climate Change issues are intrinsically transdisciplinary and policy-related. Bridging science and policy is a traditional problem for 7.01 researchers. We know a lot of the science (but not all), and the problems are now mainly political. 7.01 scientists have been moving into this more policy-focused area. Most Air Pollution/Climate Change problems are now in developing countries, i.e. where the potential forest-mediated effects on the local society are of most concern, and where regulations to protect forests still need to be developed.

The aim of WP 7.01.06 is to encourage new dialogue as a vehicle to move some of the science and thinking in 7.01 more into a way that can feed into policy. Collaboration with IUFRO Division 6 "Social, Economic, Information, and Policy Sciences" and Task Force on "Forest policy-science interface" is welcome. The WP is led by He Shang (Coordinator), and Luis Villarreal-Ruiz (DC) and Mandoolika Agrawal (DC).

4. Newsletter and Communication

In 2007, the RG continued to ensure communication through circulation of five issues of its electronic newsletter.

In collaboration with Claudia Goestl (IUFRO Web Management), we moved the list to IUFRO with the following name: [IUFRO RG 7.01 FORCLIMAIR]- rg70100-forclimair@lists.iufro.org. It is now a two-way system by which everyone on the list can receive all notices and add comments, respond to questions etc.

The webpage for WP 7.01.01 was populated. A webpage for the new WP 7.01.06 was set up and construction is under progress.

Last dates of website 2007 activity

IUFRO Unit	About	State of Knowledge	Activities	Public.	Newsletters	Expertise	Links
7.01.00			Nov 07	May 07	Dec 07		
7.01.01	Feb 07	Feb 07	Nov 07	Feb 07		Feb 07	Feb 07
7.01.02			Nov 07				
7.01.03			Nov 07				
7.01.04			Nov 07				
7.01.05	Jan 07		Nov 07				
7.01.06	Nov 07						

Submitted by Elena Paoletti (C-RG 7.01.00)

January 14, 2007



Eddy-correlation tower for measuring canopy-level ozone flux in a Mediterranean forest



Sap-flow measurements for the calculation of crown-level stomatal ozone flux in Norway spruce



Excursion to San Bernardino forests – 22nd RG 7.01 meeting



Excursion to Sequoia National Park – 22nd RG 7.01 meeting