The IMPECVOC project

(**Im**pact of **P**henology and **E**nvironmental **C**onditions on B**VOC** Emissions from Forest Ecosystems)

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I still remember Prof. Marc Van den Heede and Mrs. Helga Demets and first talks regarding enrolment documentation. Those possibilities you gave me and the choices I made, opened a new chapter in my life. My name is Maja Šimpraga from Croatia and I have graduated the Master programme of Environmental Sanitation (Ghent University) with specialization in soil sanitation (2003 – 2005). For me it was a totally new experience that I gained here in Belgium during these 2 years. This way, I would like to express my special thanks to all the CES Professors and the CES staff. They gave me that useful experience that I still enjoy in my work and everyday life. After all, I stayed living and working in Belgium, having established a Belgian-Croatian family. At the moment, I am working at Ghent University as a research scientist and I am enrolled in my third year of a PhD programme. Therefore, I would like to tell you something about the project I am working on…

Have you ever been walking in a pine forest? Well, the pine tree smell you detect brings you to the smell of monoterpenes and other BVOC compounds released by the trees. In a pine forest, you indeed smell a compound called pinene (α or β coming 90 % from the genus *Pinus* of the family *Pinaceae)*. If you have been drinking a "Fanta lemon": then you taste a compound called limonene. These smells and aromatic substances (not all can be detected by the human nose) are called BVOCs (Biogenic Volatile Organic Compounds). The word biogenic (the opposite of anthropogenic) means that these gases are emitted from living matter, especially from trees (Figure 1).

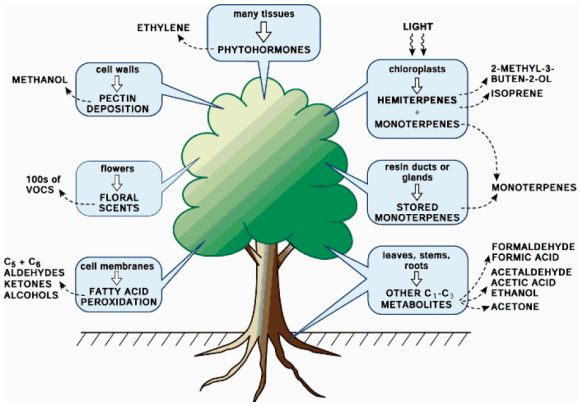

Figure 1. The well-known 'VOS tree' illustrating the tree's possibility to a) produce and b) release a variety of VOCs (Fall 1999)

Terrestrial vegetation emits more than 30 000 different organic compounds (Bäck, 1998). On a global scale, BVOC emissions (~ 1150 Tg C per year) were estimated to be an order of magnitude larger than their anthropogenic counterparts (AVOCs). Due to their large emissions and high reactivity with the main oxidants ($OH^{\bullet}$, O_3, $NO_3^{\bullet}$) in the atmosphere, BVOCs are expected to contribute significantly to atmospheric chemistry, and as such to have an important impact on air quality. When released to the atmosphere, through leaf stomata or via diffusion through the leaf cuticle (Koppmann 2007), BVOCs undergo transformation processes. In the presence of sunlight, tropospheric O_3 is produced by reactions of BVOCs and oxides of nitrogen (NOx). These reactions are particularly important in urban, polluted areas where the air quality standards are often violated (Räisänen 2008).

The IMPECVOC (**Im**pact of **P**henology and **E**nvironmental **C**onditions on B**VOC** Emissions from Forest Ecosystems) programme is a 4-year BELSPO (**Bel**gian **S**cience **P**olicy **O**ffice) funded project. It tries to make a link between CO_2 exchange by photosynthesis, water vapour release by transpiration, phenological life cycle of the trees and BVOC emissions. BVOCs have 3 major roles in the atmosphere: (1) ecological (plant–insect communication, plant–plant communication), (2) physiological (thermotolerance) and (3) atmospheric (oxidation capacity, photochemical smog formation) roles (Bäck, 1998). Isoprene (C5 hydrocarbon), monoterpenes (C10 hydrocarbons), and derivatives thereof (the so-called isoprenoids or terpenoids) are the most representative BVOCs emitted by plants in the atmosphere (Vitale et al. 2007). The objectives of the IMPECVOC project include the detailed analysis of the emissions of BVOCs occurring from deciduous *(Fagus sylvatica* L. - European beech) and coniferous (*Pseudotsuga menziesii* - Douglas fir & *Picea abies* - Norway spruce) tree species growing in the Belgian forest ecosystems. The driving variables behind BVOC emissions of the

tree species need to be unravelled by means of well-conceived experimental studies. In order to better understand the effects of environmental and ecophysiological factors on the emissions, detailed studies at a low organisational level (leaf level) are conducted and compared to BVOC emission dynamics at canopy and stand level. The question that rises is: in which way will the BVOC emissions evolve in a changing climate? IPCC (**I**ntergovernmental **P**anel on **C**limate **C**hange) 2007 states that BVOC emissions are thus expected to increase with globally rising temperatures. In order to understand the BVOC emission-driven mechanisms of trees, ecophysiological research is needed to fill the missing gaps. In order to understand and unravel the puzzle of how physiological mechanisms in trees drive BVOC emission, the study will produce a detailed analysis between these tree-environment interactions.

The bottom-up approach of the IMPECVOC project: leaf level (growth room), canopy level (Aelmoeseneie forest, Flanders) and stand level (above Vielsalm forest, Wallonie)

IMPECVOC project website:
www.impecvoc.ugent.be

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