

NEW OPENINGS OF ATMOSPHERIC SCIENCE IN HIGHER EDUCATION

T. M. Ruuskanen¹, L. Riuttanen¹, P. Hari³, M. Kulmala¹ and A. Lauri¹

¹Division of Atmospheric Sciences, Department of Physics, University of Helsinki, P.O.Box 64, FI-00014, Helsinki, Finland.

³Department of Forest Sciences, University of Helsinki, P.O.Box 27, FI-00014, Helsinki, Finland.

taina.ruuskanen@helsinki.fi

Keywords: higher education, multi-disciplinary, pedagogy, climate change, air quality

The society is facing Grand Challenges, such as climate change and air quality problems that require new education strategies. Traditional discipline oriented sectoral approach is not enough, but multidisciplinary approach combining knowledge from different disciplines and penetrate though all levels of society is needed. It is also not enough to educate degree students, but everywhere in a changing society there is urgent need to update knowledge based on the new scientific findings. Atmospheric research involves several fields of science such as chemistry, physics, meteorology, mathematics, biology, agricultural and forest sciences, technology, and geosciences, combining observations, experimentation and modelling. We have realized that the shift from discipline-tied fundamental education towards multidisciplinary is imperative for a successful career in climate and global change science [1]. Therefore we present a model to improve the learning outcomes in multidisciplinary atmospheric science. It is based on our experiences organizing more than 50 research-intensive short courses and other multidisciplinary course over the past 20 years.

During a cross disciplinary expert course learning happens over discipline borders and new ideas arise. Horizontal learning uses expertise of participants from different disciplines and background and uses the heterogeneity of the students as an asset. We have adopted horizontal learning as a broader approach, addressing a cross-section of knowledge from different fields and blending the information to reach new levels of understanding [2]. This horizontal learning principle has been shown to be a good example of participatory action research [3]. Horizontal learning can be peer learning of students of different background also teachers and assistants can learn and widen their knowledge during the course both from colleagues and from interaction with the students.

[1] Nordic Climate Change Research (2009). *NordForsk Policy Briefs 2009-8*, (Mandag Morgen, Oslo, Norway).

[2] Lauri A., Riuttanen, L., Sihvonen, P., Westerberg, S., Hari, P., Ruuskanen, T.M. and M. Kulmala, The atmospheric science paradigm and horizontal learning: experiences from short research-intensive courses (2016), *Report Series in Aerosol Science*, 180, 275.

[3] Hennessy, S. and Murphy, P. (1999). The Potential for Collaborative Problem Solving in Design and Technology. *International Journal of Technology and Design Education* **9**(1), 1–36.