

Markku Kulmala: Curriculum Vitae

Full names: Markku Tapio Kulmala

Date and place of birth: 30 October 1958, Forssa, Finland

Current Position: Professor, University of Helsinki, 1996-; Docent, University of Kuopio, 1993-; Head of Lab. of Aerosol and Environmental Physics, University of Helsinki, 1990-; Head of Division of Atmospheric Sciences, University of Helsinki, 2001-; Academy Professor, the Academy of Finland, 2004-2009; 2011-

Education and Training: University of Helsinki, Finland: 1983 M. Sc.; 1985 Lic. Phil.; 1988 Ph. D. (Physics)

Previous professional appointments

University of Helsinki, Department of Physics: Assistant (total 2 years and 2 months) 1984 - 1989; Docent 1989 – 1996. The Academy of Finland: Research Associate (total 3 years) 1985 - 1988; Junior Fellow (total 6 years) 1989 - 1995; Senior Fellow (total 1 year) 1995 – 1996. University of Vienna, Department of Experimental Physics: Visiting Scientist (total 1 month) 1988; Visiting Professor (total 1 month), 2001; Academy Professor, The Academy of Finland, 2004-2009 ; University of Stockholm, ITM and University of Lund, Department of Physics and Department of Physical Geography and Ecosystems Analysis, King Carl XVI Gustaf's Visiting professor in Environmental Science (total 12 months), 2009-2010

Lecture courses

29 different courses (1989-2015) on thermodynamics, aerosol dynamics, atmospheric chemistry and physics, environmental physics, modelling etc. in Universities of Helsinki, Kuopio, Jyväskylä, Stockholm and Lund

Funding ID

Present Research Grants (sums in Euros)

Centre of Excellence 5 600 000; FIRI 1 000 000; Other Academy funding: 2 500 000 (Academy Professor, FiDiPro, etc.) EU: 2 800 000 (Pegasos, Actris, Envri, Bacchus); Nordforsk: CRAICC 5 600 000

Previous

E.g. The Academy of Finland, Centre of excellence, 6 500 000 Euro; The Academy of Finland, 28 grants (1989-2013) 18 200 000 Euro; ERC AdG, 2 000 000; The European Union, 29 projects (1996-2013), 21 120 000 Euro; The University of Helsinki, Research grant for the Centre of Excellence, (1997-2001), 2 000 000 FIM; Private foundations (Nessling, IVO, Neste etc.), 10 grants (1988-2001) 1 300 000 FIM; The Ministry of Transport and Communications (1998-2001) 600 000 FIM; TEKES, 3 projects (2000-2004), 200 000 Euro; Research Grant for Nordic Centre of Excellence 1 200 000 Euro; Grant for NorFA Graduate school 3 000 000 NOK, 16 grants from different private foundations, 1987-2000.

Total: ca 73 500 000 Euro

Awards, Honours and Academy Membership

- The Finnish Aerosol Award for theoretical work in aerosol science, Sipoo 21.6.1988, the Finnish Association for Aerosol Research
- NOSA Aerosologist 1989, Copenhagen 9.11.1989, Nordic Society for Aerosol Research
- KATL Award for University assistants, Helsinki 9.4.1994
- GAeF Marian Smoluchowski Award for Aerosol Research, Hamburg 17.9.1997, Gesellschaft für Aerosolforschung
- The World Cultural Council, Honorary Member, Helsinki 17.11. 2003
- The Finnish Science Award, Helsinki 18.11 2003
- The International Aerosol Fellow Award, Budapest 8.9. 2004
- Honorary member, Committee on Nucleation and Atmospheric Aerosols, 29.7.2004, Kyoto, Japan
- Doctor of Natural Sciences, Honoris Causa, University of Stockholm, 30.9. 2005
- Wilhelm Bjerkenes medal (EGU), 17.4. 2007
- Honorary Chair, Finnish Association for Aerosol Research, 30.10. 2008
- Doctor, Honoris Causa, University of Tartu, 1.12. 2008
- Fellow, American Geophysical Union, May 2009
- Fuchs Memorial Award (American Association for Aerosol Research, Gesellschaft für Aerosolforschung, Japan Association of Aerosol Science and Technology), Helsinki 1.9.2010

- The professor of the year 2012 in Finland
- Doctor, Honoris Causa, Eötvös Lorand University, Hungary, 11.5.2012
- Bayer Climate Award, Berlin September 2012
- Nanjing University Honorary Professorship, China, 25.4. 2013
- Shandong University Honorary Professorship, China, 16.12. 2013
- Fudan University Honorary Professorship, China, 17.5. 2014
- Institute of Remote Sensing and Digital Earth (RADI), CAS, China, Honorary Professorship, 19.5. 2014
- IIASA Distinguished Visiting Fellow 11.2. 2015

Academy Memberships

Finnish Academy of Science and Letters (2004), Finnish Society of Sciences and Letters (2006), International Eurasian Academy of Sciences (2012), Academia Europaea (2012)

Membership in scientific societies: 8 societies

Decorations: Knight, First Class, of the Order of the White Rose of Finland, 2007

Invited talks / plenary lectures: 58 invited/plenary talks at international scientific conferences, 1994-2015

Editorial board membership: Report Series in Aerosol Science, 1986-; Journal of Aerosol Science, 1994-2002; Monte Carlo Methods and Applications, 1998-2009; Journal of Geophysical Research, Associate editor; 2000-2008; Boreal Environment Research, 2002-; Atmospheric Chemistry and Physics, 2004-; Tellus B 2005-; Aerosol Science and Technology 2007-; Geography, Environment, Sustainability 2014-; Atmospheric and Oceanic Optics 2014-

Bibliometric information (<http://www.atm.helsinki.fi/fcoe/images/julk.pdf>)

- Over 750 original research papers; 11 of which in Nature, 13 in Science, 7 in Physical Review Letters
- According to the [ISI Web of Knowledge](#), Kulmala is 1st in the Citation Rankings in Geosciences (since 1.5.2011). The total number of citations is over 27000 (from over 8000 different papers)
- H-factor is 81

Granted Patents: 3

Other academic and professional activities

Referee for Scientific Journals: 31 different journals including Nature and Science

Opponent in Doctoral Dissertations: 10 different. *Referee of Doctoral Thesis* 14

Guided Thesis: Doctoral Thesis: 63; Present doctoral students: 18; Licentiate Thesis: 8; M. Sc. Thesis: 50

Visiting professors and Senior Fellows: 26 different people

Principal investigator of scientific projects: 37 EU projects (5 of which as a coordinator); 5 Nordic projects (all of them as coordinator), 47 National projects (all of them as coordinator)

Other Chairmanships: e.g. National Climate Panel (2012-2014), National Committee of Future Earth (2013-); European Alliance / Future Earth (2013-)

Co-organizer of the following scientific conferences

European Aerosol Conference, Duisburg 4.-8.10. 1993; European Aerosol Conference, Blois, 30.5.-2.6. 1994; Fourth International Aerosol Conference, Los Angeles, 29.8.-2.9. 1994; European Aerosol Conference, Helsinki, 18.-22.9. 1995; International Conference on Nucleation and Atmospheric Aerosols, Helsinki, 26.-30.8. 1996; International Conference on Nucleation and Atmospheric Aerosols, Rolla, Missouri, USA, 6.-11.8.2000; iLEAPS: International Open Science Conference, Helsinki, Finland, 29.9.-4.10.2003; International Conference on Nucleation and Atmospheric Aerosols, Kyoto, Japan, 26.-30.7.2004; International Aerosol Conference Helsinki, Finland, 29.8.-3.9. 2010; iLEAPS Science Conference, Garmisch-Partenkirchen, Germany, 19-23.9. 2011. iLEAPS Science Conference, Nanjing, 11.5-16.5. 2014 Main organizer of 5 international PEEEX meetings. The main organizer of more than 60 annual meetings of different projects and workshops. Chair in 70 sessions at international scientific conferences.

Co-organizer of the scientific networks

Chairman of the Committee on Nucleation and Atmospheric Aerosols (CNAA), 1996-2004; Member of the steering committee of iLEAPS: Integrated Land Ecosystem – Atmosphere Processes Study, 2003-2013; Chair

1.1. 2010-31.12. 2012. Member of the Advisory and Evaluation Panel of Institute for Climate and Global Change Research, Nanjing University China, 20.10. 2009-. Chairman of Pan Eurasian Experiment (PEEX) 2012-. Future Earth: Chair European Alliance 1.11. 2013-, Future Earth: Chair National Committee 1.1. 2014-. Over 10 other positions in past.

Scientific Leadership Profile

Professor (ERC Advanced Grant holder 2009-2013) Markku Kulmala leads The Centre of Excellence in Atmospheric Science – From Molecular and Biological processes to the Global Climate (ATM). This is the third national centre of excellence lead by M. Kulmala. The Centre of Excellence consists of 280 scientists from many disciplines including physics, meteorology, chemistry, forest sciences and biology. M. Kulmala has also been the head of two Nordic Centres of Excellence (Research Unit on Biosphere – Aerosol–Cloud–Climate Interactions and Cryosphere–Atmosphere Interactions in a Changing Arctic Climate) as well as the corresponding NordForsk Graduate school (Carbon–Biosphere–Aerosol–Cloud– Climate Interactions). He has also coordinated the European Integrated project on Aerosol Cloud Climate and Air Quality Interactions (EUCAARI). He has participated in 36 other EU-projects, four of which as co-ordinator and 30 as a PI.

M. Kulmala leads the Division of Atmospheric Sciences in the Department of Physics, University of Helsinki. The research unit consists of 150 scientists. In his nearest research environment, Kulmala leads a research group in Aerosol and Environmental Physics consisting of 60 people, among them 5 professors from abroad.

M. Kulmala has a long and successful experience in research training. Under his supervision, 63 doctors have been educated, of which 13 (Vesala, Laaksonen, Hämeri, Kerminen, Lazaridis, Buzorius, Vehkamäki, Koponen, Hussein, Riipinen, Petäjä, Korhonen, Ylijuuti) currently act as professors at various Universities and Institutions. All Ph.D. students in our research team have detailed study plans, and their realistic aim is to finish their Ph.D. thesis within 2-5 years. Targeted postgraduate courses and seminars have been designed for the students. The Laboratory of Aerosol and Environmental Physics offers more than 60 ECTS in postgraduate studies, with some of the courses being organised jointly with other universities and departments. The supervision of studies is organised by Prof. Kulmala. International post-doctoral training is also ongoing.

M. Kulmala is a world leader in atmospheric aerosol science and one of the founders of “terrestrial ecosystem meteorology”. His work covers theoretical and experimental physics, atmospheric chemistry, observational meteorology, biophysics and, in particular, biosphere-aerosol-cloud-climate interactions. His main scientific goal has been to reduce scientific uncertainties concerning global climate change issues, particularly those related to aerosols and clouds. He has aimed at creating a deep understanding of the dynamics of aerosol particles and ion and neutral clusters in the lower atmosphere. His emphasis has been on biogenic formation mechanisms of aerosol particles and their linkage to biosphere-atmosphere interaction processes, biogeochemical cycles, as well as on the role of trace gases in atmospheric chemistry. To solve these interdisciplinary problems, Kulmala has created a comprehensive research program including continuous long-term atmospheric observations, global modelling and deep theoretical and experimental understanding of atmospheric cluster and aerosol dynamics. In his pioneering, wide-perspective research, Kulmala is working from the nano/molecular scale to the global scale.

Kulmala’s activities cover research, education, research infrastructures and innovations. His network is worldwide. He has been active in making new international initiatives e.g. to solve global challenges, to improve comprehensive continuous measurement networks all around the world, and to solve air quality – climate change interactions.

Recently M. Kulmala has initiated Pan Eurasian Experiment (PEEX). In this multidimensional, supradisciplinary research program the main aim is to solve the interlinked global challenges influencing human well-being, societies and nature in the northern Eurasian boreal and Arctic regions. He is also participating in efforts to solve air quality in megacities and polluted regions. Examples of these efforts are the projects “Beautiful Beijing” and “Beautiful China”.

The backbone of Kulmala’s research consists of SMEAR (Stations for Measuring the forest Ecosystem – Atmosphere Relationships) field stations. These three stations (SMEAR I, Värriö, 1991-; SMEAR II, Hyytiälä, 1994-, Urban SMEAR III, Kumpula, Helsinki, 2004-) have comprehensive scientific programs to investigate

aerosol and trace gas concentrations and fluxes, biosphere-atmosphere interactions, aerosol formation and growth, dynamics of atmospheric clusters and ions, and the biogenic background for processes leading to aerosol formation. The stations themselves, along with their research and educational programs, are planned and supervised by Markku Kulmala. Before Kulmala's work, there existed no real continuous observations on atmospheric aerosols and their dynamics, even though atmospheric aerosols are considered as the key issue in predicting future climate. The interdisciplinary research program has allowed him to discover climatically relevant feedbacks, such as his recently proposed mechanism that couples the effect of CO₂ on vegetation between the aerosol particles and climate. This suggestion is based on the close connections between photosynthesis, emissions of non-methane biogenic volatile organic compounds, and their ability to form aerosol particles. Right now, SMEAR-type stations in China, Sweden and Estonia are under construction.

The interdisciplinary orientation of prof. Kulmala's personal research has been very successfully complemented by the creation of an interdisciplinary team and the use of a wide range of modern scientific technologies. A combination of personal fundamental work with skilful leadership in large collective works has allowed Markku Kulmala to considerably advance our knowledge of the biosphere – aerosol – cloud – climate interactions, and to increase and deepen the understanding of the role of aerosols in the climate change phenomenon. His contributions to the following key topics are recognised worldwide (he has published several papers in leading journals like Nature or Science on each of these topics):

- Formation and growth mechanisms of atmospheric aerosols, aerosol dynamics, dynamics of atmospheric clusters
- atmospheric chemistry and atmospheric oxidation
- Aerosol-cloud-climate interactions
- The effect of secondary biogenic aerosols on global aerosol load
- The relationships between the atmosphere/climate and different ecosystems, particularly Boreal Forest
- Climate – air quality interactions and feedbacks

Thanks to his pioneering works, M. Kulmala and the research unit, which he leads, have acquired a leading position in the area of formation of atmospheric aerosols. His approach starts from basic nucleation theories, followed by detailed aerosol dynamic / atmospheric chemistry models and well defined laboratory experiments, and ends in wide continuous field measurements (in particular, at the University of Helsinki research stations) and 3D modelling including Earth System Models. He has proposed that atmospheric clusters are crucial for new particle formation, and that they really exist in the atmosphere. He has shown that atmospheric nucleation takes place practically all around the world, and that it makes a substantial contribution to the global aerosol load. These authoritative results have led to a widespread recognition of the importance of biogenic aerosol formation mechanisms, and research concerning their role in climate change is now performed by several research groups all over the world. These results are crucial to reduce the uncertainty in the global radiative balance.

Kulmala's research team has also a leading position in the research area of measuring turbulent fluxes of aerosol particles and their precursors. Due to the interdisciplinary approaches, long experience and recent outstanding results, the team has a unique possibility to investigate biosphere – aerosol – cloud –climate interactions, and to find out the significance of the different formation and growth processes in atmospheric conditions. Not only Markku Kulmala himself, but also his former students and other scientists involved in his team, have become key figures in international scientific organisations and networks such as IPCC, IGAC/IGBP and iLEAPS/IGBP. The latter has its international project office in Helsinki, hosted by Markku Kulmala, with his chairmanship between 1 Jan 2010 and 31 Dec 2012. More recently (2013), Kulmala started his chairmanship in Finnish National Committee of Future Earth and the European Alliance of Future Earth related committees.

In particular, Prof. Kulmala has improved our understanding of atmospheric aerosols, both by developing aerosol formation and growth theories, and by planning and developing versatile research stations, which can be considered as an example for global station network. He has also successfully investigated atmospheric new particle formation, atmospheric clusters, cloud microphysics and biosphere-aerosol-cloud-climate interactions and feedbacks.

<http://www.atm.helsinki.fi/fcoe/images/kulmala-cv4.doc>