

Markku Kulmala: Curriculum Vitae

Full names: Markku Tapio Kulmala

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

Current Position

Professor, University of Helsinki, 1996 -; Docent, University of Kuopio, 1993 -; Head of Laboratory of Aerosol and Environmental Physics, University of Helsinki, 1990 -; Head of the Division of Atmospheric Sciences, University of Helsinki, 2001-; Director of Institute for Atmospheric and Earth System Research (INAR) 1.10. 2017-; Academy Professor, The Academy of Finland, 2004-2009; 2011-2015; 2017 -; Academician, Academy of Finland, 10.3. 2017; ERC AdG Grant holder, 1.6.2017-

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

Lectured courses

30 different courses (1989-2018) on thermodynamics, aerosol dynamics, atmospheric chemistry and physics, environmental physics, modelling etc. in Universities of Helsinki, Kuopio, Jyväskylä, Stockholm, Lund and Tartu.

Funding ID

Research Grants: Present (sums in Euros):

Centre of Excellence 5 600 000; FIRI 1000 000;-; Other Academy funding: 2 500 000 (Academy Professor, FiDiPro, etc.) EU: 2 800 000 (Actris, Envri, Bacchus); ERC AdG 2 500 000; Nordforsk: CRAICC 5 600 000; Haze Beijing (BUCT/Beijing City) 19 500 000

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 95 000 000 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 of the Committee on Nucleation and Atmospheric Aerosols, 29.7.2004, Kyoto, Japan

- Doctor of Natural Sciences, Honorus 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, Honorus 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, Honorus Causa, Eötvös Lorand University, Hungary, 11.5.2012.
- Bayer Climate Award, Berlin September 2012.
- The Nanjing University, Honorary Professorship, China, 25.4. 2013
- The Shandong University, Honorary Professorship, China, 16.12. 2013
- The Fudan University, Honorary Professorship, China, 17.5. 2014
- The Institute of Remote Sensing and Digital Earth (RADI), CAS, China, Honorary Professorship, 19.5. 2014
- IIASA Distinguished Visiting Fellow 11.2. 2015
- Fedor P. Litke Gold Medal, Russian Geographical Society, 19.8. 2015
- Foreign Academician, Chinese Academy of Sciences, December 2015
- Tver State University, Honorary Professorship, Russia, 13.2. 2016
- Cosmonautics Federation of Russia, Honorary Medal, 12.4. 2016
- Tjumen State University, Doctor Honorus Causa, Russia, 2.11. 2016
- The Jiangsu International collaboration award 2016, 28.2. 2017
- Academician, Academy of Finland, Finland, 10.3. 2017
- The Wihuri International Prize, 9.10. 2017
- The Juupajoki Medal 6.12. 2017
- The Helsinki Science Prize 12.6. 2018
- The Chinese Government Friendship Award 2018, 1.10. 2018
- Silver Medal of the University of Helsinki, 29.10.2018
- Gold medal, International Eurasian Academy of Sciences, 30.10. 2018

Academy Memberships: Finnish Academy of Science and Letters (2004), The Finnish Society of Sciences and Letters (2006), The International Eurasian Academy of Sciences (2012), Academia Europaea (2012), Chinese Academy of Sciences (2015), The World Academy of of Sciences (2016), The International Silk Road Academy of Sciences (2018)

Membership in scientific societies: The Finnish Physical Society, 1982 -; The Finnish Association for Aerosol Research, 1983 - (Board member 1984 - 2008); The Nordic Society for Aerosol Research 1984 - (Board member 1989 - 1996); The Gesellschaft für Aerosolforschung, 1984 - (Board member 1996 - 2000); The American Association for Aerosol Research, 1985 -; The American Geophysical Union, 1990 -; The Finnish Society for Environmental Sciences, 1991 -; The European Geophysical Society, 1999 -;

Decorations

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

Commander, First Class, of the Order of the Lion of Finland, 2018

Invited talks / plenary lectures: 68 invited talks (plenary lectures) at international scientific conferences, 1994-2017

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- 2011; Geography, Environment, Sustainability 2014 - ; Atmospheric and Oceanic Optics 2014 - ; International Journal of Digital Earth 2014-

Bibliometric information

- Over 950 original research papers; 17 of which in Nature, 16 in Science and 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 46000 (from over 14000 different papers).
- H-factor is 104
- Highly Cited Researchers 2001, 2014, 2015, 2016, 2017, 2018 **Granted Patents: 3**

Guided Thesis: Doctoral Thesis: 70 (20 of them are nowadays professors or tenure positions); Licentiate Thesis: 8; M. Sc. Thesis: 51; B.Sc. Thesis 25; Present doctoral students: 16

Other academic and professional activities

Referee for Scientific Journals: 33 different journals including Nature and Science.

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

Visiting professors and Senior Fellows: 52 different people

Principal investigator of scientific projects: 41 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 (2013-2016).

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 6 international PEEEX meetings. The main organizer of more than 60 annual meetings of different projects and workshops. Chair in 80 sessions at international scientific conferences.

Co-organizer of the scientific networks: Chairman of the Committee on Nucleation and Atmospheric Aerosols (CNA), 1996-2004, 2018- ; 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 -; Over 10 other positions in past.

Scientific Leadership Profile

Professor (ERC Advanced Grant holder 2009-2013; 2017-2022) 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 38 other EU-projects, five of which as co-ordinator and 33 as a PI. Kulmala leads also 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, 70 doctors have been educated, of which 20 (Vesala, Laaksonen, Hämeri, Kerminen, Lazaridis, Buzorius, Vehkamäki, Koponen, Hussein, Riipinen, Petäjä, Korhonen, Dal Maso, Ylijuuti, Sipilä, Ehn, Schobesberger, Lehtipalo, Paasonen, Nieminen) currently act as professors or tenure position at various Universities and Institutions. All Ph.D. students in the 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 Division of Atmospheric Sciences offers more than 80 ECTS in postgraduate studies, with some of the courses being organised jointly with other universities and departments. The supervision of studies is organized by Prof. Kulmala (leader of the doctoral program in atmospheric sciences). Also international post-doctoral training is ongoing.

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 Kulmala has initiated a 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 newest initiative is to establish a global SMEAR station network.

Prof. Kulmala is a world leader in atmospheric aerosol science and one of the founders of “terrestrial ecosystem meteorology”. His work covers theoretical and experimental aerosol physics, atmospheric chemistry, observational meteorology, biophysics and, in particular, biosphere-aerosol-cloud-climate interactions and feedbacks as well as air quality – 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, air quality – climate interactions, 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 providing deep theoretical and experimental understanding. In his pioneering, wide-perspective research, Kulmala works from nano/molecular scale to global scale. The interdisciplinary nature 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 skillful 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 and he has published several papers in leading journals like Nature or Science on each of these topics:

1) formation and growth mechanisms of atmospheric aerosols, aerosol dynamics, dynamics of atmospheric clusters; 2) atmospheric chemistry and atmospheric oxidation; 3) aerosol-cloud-climate interactions; 4) effect of secondary biogenic aerosols on global aerosol load; 5) relationships between the atmosphere/climate in different ecosystems, particularly the Boreal Forest; 6) climate – air quality interactions and feedbacks