

## REFERENCES

- Aalto, P., Kulmala, M. and Nilsson, E.D. (1995) Nucleation events on Värrö environmental measurement station. *J. Aerosol Sci.* **26**, S411-S412.
- Agrometeorological survey 1993–1994* (1993/1994) Estonian Meteorological and Hydrological Institute, Meteorological Centre, Tallinn, (in Estonian).
- Ahrens, C.D. (1993) *Essentials of Meteorology. An Invitation to the Atmosphere*. West Publishing Company, Minneapolis/St. Paul, 438 p.
- Arnold, F. (1980) Multi-ion complexes in the stratosphere - implications for trace gases and aerosol. *Nature* **284**, 610-611.
- Arnold, F., Heitmann, H. and Oberfrank, K. (1984) First composition measurements of positive ions in the upper troposphere. *Planet. Space Sci.* **32**, 1567-1576.
- Arnold, F., Curtius, J., Sierau, B., Bürger, V., Busen, R. and Schumann, U. (1999) Detection of massive negative chemions in the exhaust plume of a jet aircraft. *Geophys. Res. Lett.* **26**, 1577-1580.
- Arold, M.U. and Matisen, R.L. (1979) On atmospheric electricity in the Northern Caucasus (in Russian). *Acta et Comm. Univ. Tartuensis* **479**, 57-61.
- Arold, M.U. and Matisen, R. (1992) Atmospheric electricity at the prospective Borovoye background monitoring station (in Russian). *Acta et comm. Univ. Tartuensis* **947**, 57-59.
- Arold, M.U., Matisen, R.L., Reinart, M.A. and Övel, J.R. (1981) About the observations of the phenomena of atmospheric electricity on Vilsandi island (in Russian). *Acta et Comm. Univ. Tartuensis* **588**, 40-48.
- Beig, G. and Brasseur, G.P. (2000) Model of tropospheric ion composition: A first attempt. *J. Geophys. Res.* **105**, 22671-22684.
- Berliner Wetterkarte (The weather maps, Institute of Meteorology, University of Berlin) 1993–1994*.
- Birmili, W. (1998) *Production of new ultrafine aerosol particles in continental air masses*. Ph.D. Thesis. University of Leipzig, 107 p.
- Birmili, W. and Wiedensohler, A. (2000) New particle formation in the continental boundary layer: Meteorological and gas phase parameter influence. *Geophys. Res. Letters* **27**, 3325-3328.
- Birmili, W., Wiedensohler, A., Plass-Duelmer, C. and Berresheim, H. (2000) Evolution of newly formed aerosol particles in the continental boundary layer: A case study including OH and H<sub>2</sub>SO<sub>4</sub> measurements. *Geophys. Res. Letters* **27**, 2205-2208.
- Bricard, J. (1962) La fixation des petits ions atmosphériques sur les aérosols ultra-fins. *Geofisica pura e applicata* **51**, 271-276.
- Bricard, J., Cabane, M., Madelaine, G. and Vigla, D. (1972) Formation and properties of neutral ultrafine particles and small ions conditioned by gaseous impurities of the air. *J. Colloid Interface Sci.* **39**, 42-58.
- Cabane, M., Krien, P., Madelaine, G. and Bricard, J. (1976) Mobility spectra of ions created in gases under atmospheric pressure. *J. Colloid Interface Sci.* **57**, 289-300.
- Cabane, M., Krien, P., Madelaine, G. and Bricard, J. (1977) Mobility spectra of ions created in gases under atmospheric pressure. In *Electrical Processes in Atmospheres*, edited by Dolezalek, H. and Reiter, R., Dr. Dietrich Steinkopff Verlag, Darmstadt, Germany, pp. 30-39.
- Cabane, M. and Milani, M.R. (1983) Study of the mobility of small ions in the air. *Res. Lett. Atmos. Electr.* **3**, 55-59.
- Carr, T.W. (1984) *Plasma Chromatography*. Plenum, New York, 259 p.
- Castleman, A.W.Jr., Holland, P.M. and Keesee R.G. (1978) The properties of ion clusters and their relationship to heteromolecular nucleation. *J. Chem. Phys.* **68**, 1760-1767.
- Clement, C.F., Pirjola, L., dal Maso, M., Mäkelä J., M. and Kulmala, M. (2001) Analysis of particle formation bursts observed in Finland. *J. Aerosol Sci.* **32**, 217-236.
- Chalmers, J.A. (1967) *Atmospheric Electricity*. Pergamon Press, Oxford, London, 515 p.
- Cobb, W.E. and Wells, H.J. (1970) The electrical conductivity of oceanic air and its correlations to global atmospheric pollution. *J. Atmos. Sci.* **27**, 814-819.
- Covert, D.S., Kapustin, V.N., Quinn, P.K. and Bates, T.S. (1992) New particle formation in the marine boundary layer. *J. Geophys. Res.* **97**, 20581-20589.
- Covert, D.S., Wiedensohler, A., Aalto, P., Heintzenberg, J., McMurry, P.H. and Leck, C. (1996) Aerosol number size distributions from 3 to 500 nm diameter in the arctic marine boundary layer during summer and autumn. *Tellus* **48B**, 197-212.
- Dhanorkar, S. and Kamra, A.K. (1991) Measurement of mobility spectrum and concentration of all atmospheric ions with a single apparatus. *J. Geophys. Res.* **96**, 18671-18678.
- Dhanorkar, S. and Kamra, A.K. (1992) Relation between electrical conductivity and small ions in the presence of intermediate and large ions in the lower atmosphere. *J. Geophys. Res.* **97**, 20345-20360.
- Dhanorkar, S. and Kamra, A.K. (1993a) Diurnal variations of the mobility spectrum of ions and size distribution of fine aerosols in the atmosphere. *J. Geophys. Res.* **98**, 2639-2650.
- Dhanorkar, S. and Kamra, A.K. (1993b) Diurnal and seasonal variations of the small-, intermediate-, and large-ion concentrations and their contributions to polar conductivity. *J. Geophys. Res.* **98**, 14895-14908.
- Dhanorkar, S. and Kamra, A.K. (1994) Diurnal variation of ionization rate close to ground. *J. Geophys. Res.* **99**, 18523-18526.
- Dhanorkar, S. and Kamra, A.K. (1997) Calculation of electrical conductivity from ion-aerosol balance equations. *J. Geophys. Res.* **102**, 30147-30159.
- Dolezalek, H., Reiter, R. and Kröling, P. (1985) Basic comments on the physics, occurrence in the atmosphere, and possible biological effects of air ions. *Int. J. Biometeorol.* **29**, 207-242.
- Drozdowicz, B., Niziol, B., Wandzik, P. and Wcislaw, L. (1982) Natural ion concentration in air as an indicator of atmospheric pollution by nanometre aerosol particles. *J. Aerosol Sci.* **13**, 171-174.
- Eiceman, G.A. and Karpas, Z. (1994) *Ion Mobility Spectrometry*. CRC Press, Boca Raton, 288 p.
- Eichmeier, J. (1972) Vergleich der Beweglichkeitsspektren von "natürlichen" Luftionen und der verwendeten Messverfahren. *Z. für Geophysik* **38**, 915-923.
- Eichmeier, J. und Herden, P. (1968) Beweglichkeitsspektren künstlich erzeugter atmosphärischer Ionen im Klein- und Mittelionenbereich. *Z. angew. Physik* **24**, 360-364.

- Eichmeier, J. und Braun, W. (1972) Beweglichkeitsspektrometrie atmosphärischer Ionen. *Meteorologische Rundschau* **25**, 14-19.
- Eisele, F.L. (1983) Direct tropospheric ion sampling and mass identification. *Int. J. Mass Spectrometry and Ion Processes* **54**, 119-126.
- Eisele, F.L. (1989a) Natural and anthropogenic negative ions in the troposphere. *J. Geophys. Res.* **94**, 2183-2196.
- Eisele, F.L. (1989b) Natural and transmission line produced positive ions. *J. Geophys. Res.* **94**, 6309-6318.
- Eisele, F.L. and McDaniel, E.W. (1986) Mass spectrometric study of tropospheric ions in the northeastern and southwestern United States. *J. Geophys. Res.* **91**, 5183-5188.
- Eisele, F.L. and Tanner, D.J. (1990) Identification of ions in continental air. *J. Geophys. Res.* **95**, 20539-20550.
- Eisele, F.L. and Tanner, D.J. (1991) Ion-assisted tropospheric OH measurements. *J. Geophys. Res.* **96**, 9295-9308.
- Eisele, F.L. and Tanner, D.J. (1993) Measurement of the gas phase concentration of  $\text{H}_2\text{SO}_4$  and methane sulfonic acid and estimates of  $\text{H}_2\text{SO}_4$  production and loss in the atmosphere. *J. Geophys. Res.* **98**, 9001-9010.
- Elster, J. und Geitel, H. (1899) Über die Existenz elektrischer Ionen in der Atmosphäre. *Terr. Magn. Atmos. Elect.* **4**, 213-234.
- Erikson, H.A. (1921) The change of mobility of the positive ions in air with age. *Phys. Rev.* **18**, 100-101.
- Flagan, R.C. (1998) History of electrical aerosol measurements. *Aerosol Sci. Technol.* **28**, 301-380.
- Fuchs, N.A. (1947) On the magnitude of electrical charges carried by the particles of atmospheric aerocolloids (in Russian, with English abstract). *Izvestiya Acad. Sci. USSR, ser. geogr. geophys.* **11**, 341-348.
- Fuchs, N.A. (1955) *The Mechanics of Aerosols (in Russian)*. Akademizdat, Moscow, 351 p.
- Fuchs, N.A. (1963) On the stationary charge distribution on aerosol particles in a bipolar ionic atmosphere. *Geofisica pura e applicata* **56**, 185-193.
- Harrison, R.G. (2000) Cloud formation and the possible significance of charge for atmospheric condensation and ice nuclei. *Space Science Reviews* **94**, 381-396.
- Hidy, G.M. (1984) *Aerosols. An Industrial and Environmental Science*. Academic Press, Inc., 757 p.
- Hoegl, A. (1963) Messung von Konzentration und Beweglichkeit atmosphärischer Ionen. *Z. angew. Physik* **16**, 252-258.
- Hogg, A.R. (1939) The intermediate ions of the atmosphere. *Proc. Phys. Soc. of London* **51**, 1014-1027.
- Hopke, P.K. and Ramamurthi, M. (1988) Production of ultrafine particles by radon radiolysis. *J. Aerosol Sci.* **19**, 1323-1325.
- Hoppel, W.A. (1970) Measurement of the mobility distribution of tropospheric ions. *Pageoph.* **81**, 230-245.
- Hoppel, W.A. (1978) Determination of the aerosol size distribution from the mobility distribution of the charged fraction of aerosols. *J. Aerosol Sci.* **9**, 41-54.
- Hoppel, W.A. (1985) Ion-aerosol attachment coefficients, ion depletion, and the charge distribution on aerosols. *J. Geophys. Res.* **90**, 5917-5923.
- Hoppel, W.A. and Frick, G.M. (1986) Ion-aerosol attachment coefficients and the steady-state charge distribution on aerosols in a bipolar ion environment. *Aerosol Sci. Technol.* **5**, 1-21.
- Hoppel, W.A. and Frick, G.M. (1990) The nonequilibrium character of the aerosol charge distributions produced by neutralizers. *Aerosol Sci. Technol.* **12**, 471-496.
- Hoppel, W.A. and Kraakevik, J.A. (1965) The mobility of tropospheric ions above the exchange layer. *J. Atmos. Sci.* **22**, 509-517.
- Hoppel, W.A., Anderson, R.V. and Willett, J.C. (1986) Atmospheric electricity in the planetary boundary layer. In *The Earth's Electrical Environment*, National Academy Press, Washington, D.C., pp. 149-165.
- Hoppel, W.A., Fitzgerald, J.W., Frick, G.M., Larson, R.E. and Mack, E.J. (1990) Aerosol size distributions and optical properties found in the marine boundary layer over the Atlantic Ocean. *J. Geophys. Res.* **95**, 3659-3686.
- Hoppel, W.A., Frick, G.M., Fitzgerald, J.W. and Larson, R.E. (1994) Marine boundary layer measurements of new particle formation and the effects nonprecipitating clouds have on aerosol size distribution. *J. Geophys. Res.* **99**, 14443-14459.
- Hõrrak, U. (1987) Statistical results of air ions and aerosol measurements on the island of Vilsandi in the summer of 1984 (in Russian). *Acta et Comm. Univ. Tartuensis* **755**, 47-57.
- Hõrrak, U., Tammet, H., Iher, H. and Salm, J. (1988a) The dependence of air ion spectra on wind by measurements in Tahkuse in 1985 (in Russian). *Acta et Comm. Univ. Tartuensis* **809**, 79-86.
- Hõrrak, U., Tammet, H., Salm, J. and Iher, H. (1988b) Diurnal and annual variations of atmospheric ionisation quantities in Tahkuse (in Russian). *Acta et comm. Univ. Tartuensis* **824**, 78-83.
- Hõrrak, U., Miller, F., Mirme, A., Salm, J. and Tammet, H. (1990) Air ion observatory at Tahkuse: Instrumentation. *Acta et Comm. Univ. Tartuensis* **880**, 33-43.
- Hõrrak, U., Iher, H., Luts, A., Salm, J. and Tammet, H. (1992) Mobility spectrum of air ions at Observatory Tahkuse. *Proc. 9th Int. Conf. on Atmospheric Electricity*, St. Petersburg, **1**, pp. 72-74.
- Hõrrak, U., Iher, H., Luts, A., Salm, J. and Tammet, H. (1994) Mobility spectrum of air ions at Tahkuse Observatory. *J. Geophys. Res.* **99**, 10697-10700.
- Hõrrak, U., Salm, J. and Tammet, H. (1995) Outbursts of nanometer particles in atmospheric air. *J. Aerosol Sci.* **26**, S207-S208.
- Hõrrak, U., Salm, J., Tamm, E. and Tammet, H. (1996) Derivation of the size spectrum of aerosol particles from a mobility spectrum. In *Nucleation and Atmospheric Aerosols 1996*, edited by Kulmala, M. and Wagner, P.E., Pergamon, New York, pp. 562-565.
- Hõrrak, U., Mirme, A., Salm, J., Tamm, E. and Tammet, H. (1998a) Air ion measurements as a source of information about atmospheric aerosols. *Atmospheric Research* **46**, 233-242.
- Hõrrak, U., Salm, J. and Tammet, H. (1998b) Bursts of intermediate ions in atmospheric air. *J. Geophys. Res.* **103**, 13909-13915.
- Hõrrak, U., Mirme, A., Salm, J., Tamm, E. and Tammet, H. (1998c) Study of covariations of aerosol and air ion mobility spectra at Tahkuse, Estonia. *J. Aerosol Sci.* **29**, S849-S850.
- Hõrrak, U., Iher, H. and Salm, J. (1998d) Keskkonnaseire Tahkulsel. Environmental Monitoring at Tahkuse. *Eesti Keskkonnaseire 1996 Estonian Environmental*

- Monitoring*, Eesti Vabariigi Keskkonnaministeeriumi Info- ja Tehnokeskus, Tallinn, lk. 30-33.
- Hõrrak, U., Salm, J. and Tammet, H. (2000) Statistical characterization of air ion mobility spectra at Takhuse Observatory: Classification of air ions. *J. Geophys. Res.* **105**, 9291-9302.
- Hõrrak U., Salm J. and Tammet H. (2001) Diurnal variation of charged atmospheric aerosols in nucleation and Aitken mode ranges. *J. Aerosol Sci.* **32**, S169–S170.
- Iher, H.R. and Salm, J.J. (1981) Dependence of the small ion mobility spectrum on the age of ions (in Russian). *Acta et Comm. Univ. Tartuensis* **588**, 33-39.
- Huertas, M.L. and Fontan, J. (1977) Evolution of tropospheric ions. In *Electrical Processes in Atmospheres*, edited by Dolezalek, H. and Reiter, R., Dr. Dietrich Steinkopff Verlag, Darmstadt, Germany, pp. 45-51.
- Iher, H.R. and Salm, J.J. (1982) Dependence of the small ion mobility spectrum on chemical air impurities (in Russian). *Acta et Comm. Univ. Tartuensis* **631**, 27-34.
- Iher, H.R., Salm, J.J. and Miller, F.G. (1983) Reaction of the mobility spectrum of small ions to the agents emerging in the heating of wire isolation materials (in Russian). *Acta et Comm. Univ. Tartuensis* **648**, 26-31.
- IPCC (International Panel on Climate Change) 1996. Climate Change 1995. In *The Science of Climate Change*, edited by Houghton J.T. et al., Cambridge Univ. Press, New York, 572 p.
- Israël, H. (1931) Zur Theorie und Methodik der Größenbestimmung von Luftionen. *Gerlands Beitr. Geophys.* **31**, 173-216.
- Israël, H. (1970) *Atmospheric Electricity*, Vol. I. Israel Program for Scientific Translations, Jerusalem, 317 p.
- Israël, H. (1973) *Atmospheric Electricity*, Vol. II. Israel Program for Scientific Translations, Jerusalem, 796 p.
- Israel, H. and Schulz, L. (1933) The mobility-spectrum of atmospheric ions-principles of measurements and results. *Terr. Magn.* **38**, 285-300.
- Israelsson, S. and Knudsen, E. (1986) Effects of radioactive fallout from a nuclear power plant accident on electrical parameters. *J. Geophys. Res.* **91**, 11909-11910.
- Israelsson, S. and Tammet H. (2001) Variation of fair weather atmospheric electricity at Marsta Observatory, Sweden, 1993–1998. *J. Atmos. Solar-Terrestrial Phys.* **63**, 1693–1703.
- Jaenicke, R. (1982) Physical aspects of the atmospheric aerosol. In *Chemistry of the unpolluted and polluted troposphere*, edited by Georgii, H. and Jaeschke, W., D. Reidel Publishing Company, pp. 341-373.
- Jaenicke, R. (1984) Our knowledge about the atmospheric aerosol. In *Proc. 11th Int. Conf. Atmospheric Aerosols, Condensation and Ice Nuclei*, 1, pp. 99-107.
- Junge, C. (1955) The size distribution and aging of natural aerosols as determined from electrical and optical data on the atmosphere. *Journal of Meteorology* **12**, 13-25.
- Juozaitis, A., Trakumas, S., Girgzdiene, R., Girgzdys, A., Sopauskiene, D. and Ulevicius, V. (1996) Investigations of gas-to-particle conversion in the atmosphere. *Atmospheric Research* **41**, 183-201.
- Kamra, A.K. and Deshpande, C.G. (1995) Possible secular change and land-to-ocean extension of air pollution from measurements of atmospheric electrical conductivity over the Bay of Bengal. *J. Geophys. Res.* **100**, 7105-7110.
- Kataoka, T., Yunoki, E., Shimizu, M., Mori, T., Tsukamoto, O., Ohhashi, Y., Sahashi, K., Maitani, T., Miyashita, K., Fujikawa, Y. and Kudo, A. (1998) Diurnal variation in radon concentration and mixing-layer depths. *Boundary-Layer Meteorology* **89**, 225-250.
- Keesee, R.G. and Castleman, A.W.Jr. (1985) Ions and cluster ions: Experimental studies and atmospheric observations. *J. Geophys. Res.* **90**, 5885-5890.
- Khlystov, A., Kos, G.P.A., ten Brink, H.M., Mirme, A., Tuch, Th., Roth, Ch. and Kreyling, W.G. (2001) Comparability of three spectrometers for monitoring urban aerosol. *Atmospheric Environment* **35**, 2045-2051.
- Kikas, Ü.E., Mirme, A.A., Peil, I.A., Tamm, E.I. and Tammet, H.F. (1985) Experimental calibration of an electrical aerosol spectrometer by the method of test aerosols (in Russian). *Acta et Comm. Univ. Tartuensis* **707**, 54-71.
- Kikas, Ü., Kolomets, S.M., Kornienko, V.I., Mirme, A., Salm, J., Sergeev, I.Ya. and Tammet, H. (1990) The complex measurement of the characteristics of aerosol and air ions in the ground layer of the atmosphere (in Russian). *Institute of Experimental Meteorology, Moscow* **51**(142), 109-117.
- Kikas, Ü., Mirme, A., Tamm, E. and Raunema, T. (1996) Statistical characteristics of aerosol in Baltic Sea region. *J. Geophys. Res.* **101**, 19319-19327.
- Kilpatrick, W.D. (1971) An experimental mass-mobility relation for ions in air at atmospheric pressure. *Proc. Annu. Conf. Mass Spectrosc.* 19th., pp. 320-325.
- Kim, T.O., Adachi, M., Okuyama, K. and Seinfeld, J.H. (1997) Experimental measurement of competitive ion-induced and binary homogeneous nucleation in SO<sub>2</sub>/H<sub>2</sub>O/N<sub>2</sub> mixtures. *Aerosol Sci. Technol.* **26**, 527-543.
- Kim, T.O., Ishida, T., Adachi, M., Okuyama, K. and Seinfeld, J.H. (1998) Nanometer-sized particle formation from NH<sub>3</sub>/SO<sub>2</sub>/H<sub>2</sub>O/air mixtures by ionizing irradiation. *Aerosol Sci. Technol.* **29**, 111-125.
- Kirkby J. Laaksonen, A. (2000) Solar variability and clouds - Discussion session 3c. *Space Science Reviews* **94**, 397-409.
- Kitagawa, N., Takahashi, C., Ikegami, M., Kanazawa, I., Misaki, M., Nakatani, S., Sekigawa, K., Masuda, S., Mochizuki, S., Shuto, K., Kojima, H. and Tsunoda, C. (1981) On the meso-scale distribution and the variation characteristics of aerosols (8<sup>th</sup> Report). *Res. Lett. Atmos. Electr.* **1**, 15-18.
- Kitagawa, N., Takahashi, C., Misaki, M. and Nakatani, S. (1983) On the meso-scale distribution and the behaviour of ions and aerosols around Tokyo city. In *Proceedings in Atmospheric Electricity*, edited by Ruhnke, L.H. and Latham, J., A. Deepak Publishing, pp. 69-72.
- Klimin, N.N. and Shvarts, Ya.M. (1996) Trends in the surface layer atmospheric electricity – the evidence estimated from long-term measurements 1916–1992. In *Proceedings 10th Conf. on Atmospheric Electricity*, Osaka, Japan, pp. 152-155.
- Knudsen, E. and Israelsson, S. (1994) Mobility spectrum of ions in the electrode effect layer. *J. Geophys. Res.* **99**, 10709-10712.
- Knutson, E.O. and Whitby, K.T. (1975) Aerosol classification by electric mobility: apparatus, theory, and applications. *J. Aerosol Sci.* **6**, 443-451.
- Kojima, H. (1982) Contributions of aerosols and the ionization intensity to the electrical conductivity of the air. *Res. Lett. Atmos. Electr.* **2**, 25-28.
- Kojima, H. (1984) Relation between intermediate ions and meteorological factors. *Res. Lett. Atmos. Electr.* **4**, 49-53.

- Koutsenogii, P. (1997) Aerosol measurements in Siberia. *Atmospheric Research* **44**, 167-173.
- Kulmala, M., Laaksonen, A., Aalto, P., Vesala, T. and Pirjola, L. (1996) Formation, growth, and properties of atmospheric aerosol particles and cloud droplets. *Geophysica* **32**, 217-233.
- Kulmala, M., Toivonen, A., Mäkelä, J.M. and Laaksonen, A. (1998) Analysis of the growth of nucleation mode particles observed in boreal forest. *Tellus* **50B**, 449-462.
- Kulmala, M., Pirjola, L. and Mäkelä, J.M. (2000) Stable sulphate clusters as a source of new atmospheric particles. *Nature* **404**, 66-69.
- Langevin, P. (1905) Sur les ions de l'atmosphère. *C. R. Acad. Sci.* **140**, 232-234.
- Langus, L. and Tammet, H. (1992) List of publications of Tartu University on air electricity in 1986–1991. *Acta et comm. Univ. Tartuensis* **947**, 160-172.
- Liu, B.Y.H. and Pui, D.Y.H. (1975) On the performance of the electrical aerosol analyzer. *J. Aerosol Sci.* **6**, 249-264.
- Luts, A. (1995) *Mathematical simulation of the evolution of air ions. Ph. D. Thesis.* University of Tartu, 150 p.
- Luts, A. (1998) Temperature variation of the evolution of positive small air ions at constant relative humidity. *J. Atmos. Solar-Terrestrial Phys.* **60**, 1739-1750.
- Luts, A. and Salm, J. (1994) Chemical composition of small atmospheric ions near the ground. *J. Geophys. Res.* **99**, 10781-10785.
- Mäkelä, J.M., Jokinen, V. and Kulmala, M. (1995) Small ion mobilities during particle formation from irradiated SO<sub>2</sub> in humid air. *J. Aerosol Sci.* **26**, S333-S334.
- Mäkelä, J.M., Jokinen, V., Mattila, T., Ukkonen, A. and Keskinen, J. (1996a) Mobility distribution of acetone cluster ions. *J. Aerosol Sci.* **27**, 175-190.
- Mäkelä, J.M., Riihelä, M., Ukkonen, A., Jokinen, V. and Keskinen, J. (1996b) Comparison of mobility equivalent diameter with Kelvin-Thomson diameter using ion mobility data. *J. Chem. Phys.* **105**, 1562-1571.
- Mäkelä, J.M., Aalto, P., Jokinen, V., Pohja, T., Nissinen, A., Palmroth, S., Markkanen, T., Seitsonen, K., Lihavainen, H. and Kulmala, M. (1997) Observations of ultrafine aerosol particle formation and growth in boreal forest. *Geophys. Res. Lett.* **24**, 1219-1222.
- Mäkelä, J.M., Hämeri, K., Väkevä, M., Aalto, P., Laakso, L., Kulmala, M. and Charlson, R.J. (1998) On the spatial scale of new aerosol particle formation in southern Finland. *J. Aerosol Sci.* **29**, S215-S216.
- Mäkelä, J.M., Koponen, I.K., Aalto, P. and Kulmala, M. (2000a) One-year data of submicron size modes of tropospheric background aerosol in southern Finland. *J. Aerosol Sci.* **31**, 595-611.
- Mäkelä, J.M., Dal Maso, M., Pirjola, L., Keronen, P., Laakso, L., Kulmala, M. and Laaksonen, A. (2000b) Characteristics of the atmospheric particle formation events observed at a boreal forest site in southern Finland. *Boreal Env. Res.* **5**, 299-313.
- Mäkelä, J.M., Salm, J., Smirnov, V.V., Koponen, I., Paatero, J., Pronin, A.A. (2001) Electrical charging state of fine and ultrafine particles in boreal forest air. *J. Aerosol Sci.* **32**, S149-S150.
- Manes, A. (1977) Particulate air pollution trends deduced from atmospheric conductivity measurements at Bet-Dagan (Israel). In *Electrical Processes in Atmospheres*, edited by Dolezalek, H. and Reiter, R., Dr. Dietrich Steinkopff Verlag, Darmstadt, pp. 109-118.
- Marran, H. (1958) The study of relationship between atmospheric ions and meteorological elements (in Estonian, with English summary). *Acta et Comm. Univ. Tartuensis* **59**, 108-138.
- Marsh, N. and Svensmark, H. (2000) Cosmic rays, clouds, and climate. *Space Science Reviews* **94**, 215-230.
- Mason, E.A. (1984) Ion mobility: Its role in plasma chromatography. In *Plasma Chromatography*, edited by Carr, T.W., Plenum, New York, pp. 43-93.
- Mason, E.A. and McDaniel, E.W. (1988) *Transport Properties of Ions in Gases*. John Wiley, New York, 560 p.
- Matisen, R., Miller, F., Tammet, H. and Salm, J. (1992) Air ion counters and spectrometers designed in Tartu University. *Acta et Comm. Univ. Tartuensis* **947**, 60-67.
- Mattsson, R. (1970) Seasonal variation of short-lived radon progeny, Pb<sup>210</sup> and Po<sup>210</sup>, in ground level air in Finland. *J. Geophys. Res.* **75**, 1741-1744.
- McClellan, R.O. and Miller, F.J. (1997) An overview of EPA's proposed revision of the particulate matter standard. *CIIT Activities (Chemical Industry Institute of Toxicology)* **17**, 1-23.
- McGovern, F.M., Jennings, S.G. and O'Connor, T.C. (1996a) Aerosol measurements and evidence of gas-to-particle conversion processes at Mace Head, Ireland. In *Nucleation and Atmospheric Aerosols 1996*, edited by Kulmala, M. and Wagner, P.E., Pergamon, New York, pp. 734-737.
- McGovern, F.M., Jennings, S.G., O'Connor, T.C. and Simmonds, P.G. (1996b) Aerosol and trace gas measurements during the Mace Head experiment. *Atmospheric Environment* **30**, 3891-3902.
- McMurry, P.H. (2000) A review of atmospheric aerosol measurements. *Atmospheric Environment* **34**, 1959-1999.
- Mirme, A.A. (1982) An electrical aerosol analyzer combined with a minicomputer of the type "Elektronika D3-28" (in Russian). *Acta et Comm. Univ. Tartuensis* **631**, 111-118.
- Mirme, A. (1987) About the calibration of the electrical aerosol spectrometer (in Russian). *Acta et Comm. Univ. Tartuensis* **755**, 71-79.
- Mirme, A. (1994) *Electric Aerosol Spectrometry. Ph.D. thesis.* University of Tartu, Tartu, 129 p.
- Mirme, A., Reinart, A., Kikas, Ü., Tamm, E., Dubrovin, M.A., Bernotas, T. and Peil, I. (1987) Measurement of calibration aerosol spectra. Comparison of the TSI aerosol analyzer with the TSU spectrometer (in Russian). *Acta et Comm. Univ. Tartuensis* **755**, 80-88.
- Misaki, M. (1950) A method of measuring the ion spectrum. *Pap. Meteorol. Geophys.* **1**, 313-318.
- Misaki, M. (1961a) Studies on the atmospheric ion spectrum (I). Procedures of experimental and data analysis. *Pap. Meteorol. Geophys.* **12**, 247-260.
- Misaki, M. (1961b) Studies on the atmospheric ion spectrum (II). Relation between the ion spectrum and the electrical conductivity. *Pap. Meteorol. Geophys.* **12**, 261-276.
- Misaki, M. (1964) Mobility spectrums of large ions in the New Mexico semidesert. *J. Geophys. Res.* **69**, 3309-3318.
- Misaki, M. (1976) Measurements of atmospheric electricity (in Japanese). *Kisho Kenkyu Noto* **130**, 105-118.
- Misaki, M. and Kanazawa, I. (1969) Some features of the dynamic spectrum of atmospheric ions throughout the mobility range 4.22–0.00042 cm<sup>2</sup>/Volt sec. In

- Planetary Electrodynamics*, edited by Coroniti, S.C. and Hughes, J., Gordon and Breach Science Publishers, New York, London, Paris, **1**, pp. 249-255.
- Misaki, M., Ohtagaki, M. and Kanazawa, I. (1972a) Mobility spectrometry of the atmospheric ions in relation to atmospheric pollution. *Pure Appl. Geophys.* **100**, 133-145.
- Misaki, M., Ikegami, M. and Kanazawa, I. (1972b) Atmospheric electrical conductivity measurement in the Pacific Ocean, exploring the background level of global pollution. *J. Meteorol. Soc. Japan* **50**, 497-500.
- Misaki, M., Ikegami, M. and Kanazawa, I. (1975) Deformation of the size distribution of aerosol particles dispersing from land to ocean. *J. Meteorol. Soc. Japan* **53**, 111-120.
- Mitt, A. (1946) Small ion density variation in atmosphere in Tartu in 1937 (in Estonian). *Acta et Comm. Univ. Tartuensis* **2**, 3-42.
- Mohnen, V.A. (1977) Formation, nature and mobility of ions of atmospheric importance. In *Electrical Processes in Atmospheres*, edited by Dolezalek, H. and Reiter, R., Dr. Dietrich Steinkopff Verlag, Darmstadt, Germany, pp. 1-17.
- Mount, G.H., Eisele, F.L., Tanner, D.J., Brault, J.W., Johnston, P.V., Harder, J.W., Williams, E.J., Fried, A. and Shetter, R. (1997) An intercomparison of spectroscopic laser long-path and ion-assisted in situ measurements of hydroxyl concentrations during the Tropospheric OH Photochemistry Experiment, fall 1993. *J. Geophys. Res.* **102**, 6437-6455.
- Nagato, K. and Ogawa, T. (1998) Evolution of tropospheric ions observed by an ion mobility spectrometer with a drift tube. *J. Geophys. Res.* **103**, 13917-13925.
- Nagato, K., Tanner, D.J., Friedli, H.R. and Eisele, F.L. (1999) Field measurement of positive ion mobility and mass spectra at a Colorado site in winter. *J. Geophys. Res.* **104**, 3471-3482.
- Nakatani, S., Hiruta, Y., Sekigawa, K. and Tsunoda, C. (1982) Properties of size distribution of submicron particles in the atmosphere. In *Proceedings 6th International Symposium on Contamination Control*, pp. 29-32.
- Nilsson, E.D. and Kulmala, M. (1998) The potential for atmospheric mixing processes to enhance the binary nucleation rate. *J. Geophys. Res.* **103**, 1381-1389.
- Nilsson, E.D., Paatero, J. and Boy, M. (2001) Effects of air masses and synoptic weather on aerosol formation in the continental boundary layer. *Tellus* **53B**, 462-478.
- Nolan, J.J. and de Sachy, G.P. (1927) Atmospheric ionization. *Proc. Roy. Irish Acad. A* **37**, 71-94.
- Noppel, M. (1996) Nucleation in the presence of air ions and aerosol particles. In *Nucleation and Atmospheric Aerosols*, edited by Kulmala, M. and Wagner, P.E., Pergamon, pp. 208-211.
- Norinder, H and Siksna, R. (1952) Variations of the concentration of ions at different heights near the ground during quiet summer nights at Uppsala. *Arkiv för Geofysik* **1**, 519-541.
- Ogawa T. (1985) Fair-weather electricity. *J. Geophys. Res.*, **90**, 5951-5960.
- Parts, T. (1992) Organic nitrogen-containing trace gases in the atmosphere and their influence on the mobility spectra of small air ions. *Proc. 9th Int. Conf. on Atmospheric Electricity 1992*, St.Petersburg, Russia, pp. 536-539.
- Parts, T. (1995) Small air ions as precursors of aerosol particles. *J. Aerosol Sci.* **26**, S319-S320.
- Parts, T.-E. (1997) The influence of organic nitrogen- and oxygen-containing trace gases on the mobility spectra of small air ions. *J. Aerosol Sci.* **28**, S703-S704.
- Parts, T.-E. (1999a) Seasonal dependence of electrical mobility spectra of small air ions. In *11th International Conference on Atmospheric Electricity*, edited by Christian, H.J., NASA, MSFC, Alabama, pp. 563-566.
- Parts, T.-E. (1999b) Comparison of indoor and outdoor small air ions. *J. Aerosol Sci.* **30**, S593-S594.
- Parts, T.-E. and Luts, A. (2000) One-second small ions - modelling and laboratory experiments. *J. Aerosol Sci.* **31**, S338-S339.
- Parts, T. and Salm, J. (1992) The effect of pyridine and its homologues on mobility spectra of positive small air ions. *Acta et Comm. Univ. Tartuensis* **947**, 24-30.
- Pollock, J.A. (1915) A new type of ion in the air. *Philos. Mag.* **29**, 636-646.
- Porstendörfer, J. (1994) Properties and behaviour of radon and thoron and their decay products in the air. *J. Aerosol Sci.* **25**, 219-263.
- Prüller, P.K. (1970) Investigations of atmospheric ion spectra, hygienical and biometeorological significance of ionization in Tartu (in Russian, with English summary). *Acta et Comm. Univ. Tartuensis* **240**, 61-139.
- Prüller, P. and Reinet, J. (1966) Long-term investigations of atmospheric ionization in Tartu, Estonian SSR. *Int. J. Biometeorol.* **10**, 127-133.
- Punkinen, R.K. (1988) Automatic colorimetric detector for traces of nitrogen dioxide in air. *Rev. Sci. Instrum.* **59**, 163-166.
- Raes, F. and Janssens, A. (1985) Ion-induced aerosol formation in a H<sub>2</sub>O-H<sub>2</sub>SO<sub>4</sub> system. I. Extension of the classical theory and search for experimental evidence. *J. Aerosol Sci.* **16**, 217-227.
- Raes, F. and Van Dingenen, R. (1992) Simulation of condensation and cloud condensation nuclei from biogenic SO<sub>2</sub> in the remote marine boundary layer. *J. Geophys. Res.* **97**, 12901-12912.
- Raes, F., Van Dingenen, R., Vignati, E., Wilson, J., Putaud, J.-P., Seinfeld, J.H. and Adams, P. (2000) Formation and cycling of aerosols in the global troposphere. *Atmospheric Environment* **34**, 4215-4240.
- Ramamurthi, M., Strydom, R., Hopke, P.K. and Holub, R.F. (1993) Nanometer and ultrafine aerosols from radon radiolysis. *J. Aerosol Sci.* **24**, 393-407.
- Raunemaa, T., Kuuspalo, K., Ålander, T., Mirme, A. and Tamm, E. (1996) Age estimation of atmospheric black carbon over Finland from combined aerosol size distribution and radon progeny measurements. *J. Aerosol Sci.* **27**, 455-465.
- Reinet, J. (1958) Atmospheric ionization variations in Tartu during one year (in Estonian, with English summary). *Acta et Comm. Univ. Tartuensis* **59**, 71-107.
- Reischl, G.P., Mäkelä, J.M., Karch, R. and Necid, J. (1996) Bipolar charging of ultrafine particles in the size range below 10 nm. *J. Aerosol Sci.* **27**, 931-949.
- Reiter, R. (1984) Under which conditions can recordings of the atmospheric electric conductivity be regarded as indicator of particulate air pollution?. *Res. Lett. Atmos. Electr.* **4**, 35-48.
- Reiter, R. (1985) Frequency distribution of positive and negative small ion concentrations, based on many years' recordings at two mountain stations, located at 740 and 1780 m ASL. *Int. J. Biometeorol.* **29**, 223-231.
- Retalis, D. and Pitta, A (1989) Effects on electrical parameters at Athens Greece by radioactive fallout from a nuclear power plant accident. *J. Geophys. Res.* **94**, 13093-13097.

- Retalis, D. and Retalis, A. (1998) Effects of air pollution and wind on the large-ion concentration in the air above Athens. *J. Geophys. Res.* **103**, 13927-13932.
- Retalis, D., Pitta, A. and Psallidas, P. (1991) The conductivity of the air and other electrical parameters in relation to meteorological elements and air pollution in Athens. *Meteorol. Atmos. Phys.* **46**, 197-204.
- Rosen, J.M., Hofmann, D.J. and Gringel, W. (1985) Measurements of ion mobility to 30 km. *J. Geophys. Res.* **90**, 5876-5884.
- Ruhnke, L.H., Tammet, H. and Arold, M. (1983) Atmospheric electric currents at widely spaced stations. *Proceedings in Atmospheric Electricity*, A. Deepak Publ., Hampton (Virg.), pp. 76-78.
- Rycroft, M.J., Israelsson, S. and Price, C. (2000) The global atmospheric electric circuit, solar activity and climate change. *J. Atmos. Solar-Terrestrial Phys.* **62**, 1563-1576.
- Salm, J.J. (1981) Ten-channel air ion spectrometer (in Russian). *Metody i Pribory Bioinformatsii i Kontrolya Parametrov Okruzhayushchey Sredy. Mezhevuz. Sb.*, Leningrad, **150**, pp. 34-38.
- Salm, J. (1986) Air Electricity Laboratory of Tartu State University: a historical survey. *Ionizatsiya, aerozoli, elektrometriya. Bibliograficheskii ukazatel nauchnykh publikatsii Tart. gos. un-ta za 1946-1985 gg.*, Tartu, pp. 15-21.
- Salm, J. (1988) The average mobility spectrum of large air ions of the troposphere. *Res. Lett. Atmos. Electr.* **8**, 21-24.
- Salm, J.J. and Reinart, M.A. (1992) Measurement of air ion mobility spectra in a wide range. *Acta et comm. Univ. Tartuensis* **947**, 31-34.
- Salm, J., Tammet, H., Iher, H. and Hörrak, U. (1992) The dependence of small air ion mobility spectra in the ground layer of the atmosphere on temperature and pressure. *Acta et Comm. Univ. Tartuensis* **947**, 50-56.
- Schröder, F. and Ström, J. (1997) Aircraft measurements of sub micrometer aerosol particles (>7nm) in the midlatitude free troposphere and tropopause region. *Atmospheric Research* **44**, 333-356.
- Seinfeld, J.H. and Pandis, S.N. (1998) *Atmospheric chemistry and physics: From air pollution to climate change*. John Wiley & Sons, Inc., New York.
- Sekigawa, K., Hiruta, Y. and Nakatani, S. (1981) Variability of the size distributions of atmospheric aerosols. *Res. Lett. Atmos. Electr.* **1**, 79-83.
- Sekigawa, K., Hiruta, Y., Tsunoda, C. and Nakatani, S. (1982a) An improved mobility analyzer for determining the size distribution of submicron aerosols. *J. Meteorol. Soc. Japan* **60**, 908-915.
- Sekigawa, K., Hiruta, Y., Tsunoda, C. and Nakatani, S. (1982b) Characteristics of time variations in the size distribution of atmospheric aerosols. *Res. Lett. Atmos. Electr.* **2**, 21-24.
- Sekigawa, K., Hiruta, Y., Tsunoda, C. and Nakatani, S. (1983) Properties of aerosol size distributions depending upon the meteorological conditions. In *Proceedings in Atmospheric Electricity*, edited by Ruhnke, L.H. and Latham, J., A. Deepak Publishing, pp. 106-108.
- Sheftel, V.M., Chernyshev, A.K. and Chernysheva, S.P. (1994) Air conductivity and atmospheric electric field as an indicator of anthropogenic atmospheric pollution. *J. Geophys. Res.* **99**, 10793-10795.
- Shine K.P., Forster, P.M.F. (1999) The effect of human activity on radiative forcing of climate change: A review of recent developments. *Global and Planetary Change* **20**, 205-225.
- Siksna, R. (1950) Variations of large-ions in atmospheric air during disturbed weather conditions. *Arkiv för Geofysik* **1**, 237-246.
- Smirnov, V.V. (1983) Electrical factors of air pureness (in Russian). *Institute of Experimental Meteorology, Moscow* **30** (104), 64-106.
- Suzuki, K., Iritani, M. and Mitsukuchi, T. (1982) Measurements of small ion mobility spectrum with multi-electrodes Gerdien condenser. *Res. Lett. Atmos. Electr.* **2**, 1-4.
- Sternzat, M.S. (1978) *Meteorological instruments and measurements* (in Russian). Gidrometeoizdat, Leningrad, 392 p.
- Svensmark, H. and Friis-Christensen, E. (1997) Variation of cosmic ray flux and global cloud coverage – a missing link in solar-climate relationships. *J. Atmos. Solar-Terrestrial Phys.* **59**, 1225-1232.
- Tamm, E., Hörrak, U., Mirme, A. and Vana, M. (2001) On the charge distribution on atmospheric nanoparticles. *J. Aerosol Sci.* **32**, S347-S348.
- Tammet, H. (1970) *The aspiration method for the determination of atmospheric ion-spectra*. Jerusalem, 208 p.
- Tammet, H.F. (1975a) Dependence of the spectrum of small ion mobilities on the trace admixtures in air (in Russian). *Acta et Comm. Univ. Tartuensis* **348**, 3-15.
- Tammet, H.F. (1975b) *Introduction into the theory of linear finite-dimensional spectrometry* (in Russian). Valgus, Tallinn, 100 p.
- Tammet, H. (1980) A piecewise linear model of spectrum for the measurement of air ions and aerosols (in Russian). *Acta et comm. Univ. Tartuensis* **534**, 45-54.
- Tammet, H. (1988) Models of size spectrum of tropospheric aerosol. *Lecture Notes in Physics* **309**, 75-78.
- Tammet, H. (1990) Air ion observatory at Tahkuse: Software. *Acta et Comm. Univ. Tartuensis* **880**, 44-51.
- Tammet, H. (1991) Aerosol electrical density: Interpretation and principles of measurement. *Report Series in Aerosol Science. (Helsinki)* **19**, 128-133.
- Tammet, H. (1992a) On the techniques of aerosol electrical granulometry. *Acta et Comm. Univ. Tartuensis* **947**, 94-115.
- Tammet, H. (1992b) Comparison of model distributions of aerosol particle sizes. *Acta et comm. Univ. Tartuensis* **947**, 136-149.
- Tammet, H. (1995) Size and mobility of nanometer particles, clusters and ions. *J. Aerosol Sci.* **26**, 459-475.
- Tammet, H. (1998a) Air ions. In *CRC Handbook of Chemistry and Physics, 79th edition*, CRC Press, Boca Raton, Ann Arbor, London, Tokyo, **14**, pp. 32-34.
- Tammet, H. (1998b) Reduction of air ion mobility to standard conditions. *J. Geophys. Res.* **103**, 13933-13937.
- Tammet, H. and Kimmel, V. (1998) Electrostatic deposition of radon daughter clusters on the trees. *J. Aerosol Sci.* **29**, S473-S474.
- Tammet, H. and Noppel, M. (1992) Principles of the graduation of an electric aerosol granulometer. *Acta et comm. Univ. Tartuensis* **947**, 116-124.
- Tammet, H.F., Hilpus, A.O., Salm, J.J. and Üts, E.J. (1977) An air ion spectrometer for the detection of some air impurities (in Russian). *Acta et Comm. Univ. Tartuensis* **409**, 84-88.
- Tammet, H.F., Mirme, A.A. and Tamm, E.I. (1983) On electric aerosol analysis (in Russian). *Institute of Experimental Meteorology, Moscow* **30** (104), 122-136.
- Tammet, H.F., Iher, H.R. and Miller, F.G. (1985) Mobility spectra of one-second-aged small air ions in natural air (in Russian). *Acta et Comm. Univ. Tartuensis* **707**, 26-36.

- Tammet, H., Miller, F., Tamm, E., Bernotas, T., Mirme, A. and Salm, J. (1987a) Apparatus and methods for the spectrometry of small air ions (in Russian). *Acta et Comm. Univ. Tartuensis* **755**, 18-28.
- Tammet, H., Iher, H. and Salm, J. (1987b) The spectrum of atmospheric ions in the range of 0.32-3.2 cm<sup>2</sup>/(V·s). *Acta et Comm. Univ. Tartuensis* **755**, 29-46.
- Tammet, H., Salm, J. and Iher, H. (1988) Observation of condensation on small air ions in the atmosphere. *Lecture Notes in Physics* **309**, 239-240.
- Tammet, H., Iher, H. and Salm, J. (1992) Spectrum of atmospheric ions in the mobility range 0.32–3.2 cm<sup>2</sup>/(V·s). *Acta et Comm. Univ. Tartuensis* **947**, 35-49.
- Tammet, H., Mirme, A. and Tamm, E. (1998) Electrical aerosol spectrometer of Tartu University. *J. Aerosol Sci.* **29**, S427-S428.
- Tammet, H., Kimmel, V. and Israelsson, S. (2001) Effect of atmospheric electricity on dry deposition of airborne particles from atmosphere. *Atmospheric Environment* **35**, 3413-3419.
- Tanner, D.J. and Eisele, F.L. (1991) Ions in oceanic and continental air masses. *J. Geophys. Res.* **96**, 1023-1031.
- Thomson, J.J. and Thomson, G.P. (1928) *Conduction of Electricity through Gases*. Cambridge University Press, Cambridge, 491 p.
- Thuillard, M. (1995) Electric mobility measurements of small ions in the temperature range -40°- 20°C at constant relative humidity of 87%. *J. Aerosol Sci.* **26**, 219-225.
- Tuomi, T.J. (1989) Ten year summary 1977-1986 of atmospheric electricity measured at Helsinki-Vantaa airport, Finland. *Geophysica* **25**, 1-20.
- Turco, R.P., Zhao, J.-X. and Yu, F. (1998) A new source of tropospheric aerosols: Ion-ion recombination. *Geophys. Res. Lett.* **25**, 635-638.
- Turco, R.P., Zhao, J.-X. and Yu, F. (2000) Tropospheric sulfate aerosol formation via ion-ion recombination. *J. Air Waste Manag. Assoc.* **50**, 902-907.
- Tverskoi, P.N. (1949) *Atmospheric Electricity* (in Russian). Gidrometeoizdat, Leningrad, 252 p.
- Ulevičius, V., Girgždys, A. and Trakumas, S. (1991) The dependence of typical aerosol size spectra configuration on air mass trajectories. *J. Aerosol Sci.* **22**, S621-S624.
- Vana, M., Hörrak, U. and Tamm, E. (2000) Comparative study of the ultrafine aerosol particle and intermediate air ion concentration bursts in the atmosphere. *J. Aerosol Sci.* **31**, S176-S177.
- Viggiano, A.A. (1993) *In situ* mass spectrometry and ion chemistry in the stratosphere and troposphere. *Mass Spectrometry Reviews* **12**, 115-137.
- Vohra, K.G., Vasudevan, K.N. and Nair, P.V.N. (1970) Mechanisms of nucleus-forming reactions in the atmosphere. *J. Geophys. Res.* **75**, 2951-2960.
- Wait, G.R. and Torreson, O.W. (1934) The large-ion and small-ion content of the atmosphere at Washington, D. C. *Terr. Magn. Atmos. Electr.* **39**, 111-119.
- Weber, R.J., McMurry, P.H., Eisele, F.L. and Tanner, D.J. (1995) Measurement of expected nucleation precursor species and 3-500-nm diameter particles at Mauna Loa observatory, Hawaii. *J. Atmos. Sci.* **52**, 2242-2257.
- Weber, R.J., Marti, J.J., McMurry, P.H., Eisele, F.L., Tanner, D.J. and Jefferson, A. (1997) Measurements of new particle formation and ultrafine particle growth rates at a clean continental site. *J. Geophys. Res.* **102**, 4375-4385.
- Weiss, R. und Steinmauer, R. (1937) Messungen der Luftionen in Innsbruck. *Gerlands Beiträge zur Geophysik* **50**, 238-251.
- Whipple, E.C. (1960) An improved technique for obtaining atmospheric ion mobility distributions. *J. Geophys. Res.* **65**, 3679-3684.
- Whitby, K.T. (1978) The physical characteristics of sulfur aerosols. *Atmospheric Environment* **12**, 135-159.
- Whitby, K.T. and Clark, W.E. (1966) Electric aerosol particle counting and size distribution measuring system for the 0.015 to 1 μm size range. *Tellus* **18**, 573-586.
- Yair, Y. and Levin, Z. (1989) Charging of polydispersed aerosol particles by attachment of atmospheric ions. *J. Geophys. Res.* **94**, 13085-13091.
- Yu F. and Turco, R.P. (1998) The formation and evolution of aerosols in stratospheric aircraft plumes: Numerical simulations and comparisons with observations. *J. Geophys. Res.* **103**, 25915-25934.
- Yu F. and Turco, R.P. (2000) Ultrafine aerosol formation via ion-mediated nucleation. *Geophys. Res. Lett.* **27**, 883-886.
- Yu F. and Turco, R. (2001) From molecular clusters to nanoparticles: The role of ambient ionization in tropospheric aerosol formation. *J. Geophys. Res.* **106**, 4797-4814.
- Yunker, E.A. (1940a) The mobility spectrum of atmospheric ions. *Terr. Magn. Atmos. Electr.* **45**, 127-132.
- Yunker, E.A. (1940b) The diurnal variation and vertical distribution of atmospheric condensation-nuclei. *Terrestrial Magnetism and Atmospheric Electricity* **45**, 121-126.
- Zeleny, J. (1900) The velocity of ions produced in gases by Röntgen rays. *Philos. Trans. Roy. Soc. A*, **195**, 193-234.
- Ziereis, H. and Arnold, F. (1986) Gaseous ammonia and ammonium ions in the free troposphere. *Nature* **321**, 503-505.