Curriculum Vitae

CHRISTOPHER W. FAIRALL

I. Biographical

Name: Christopher Warren Fairall

Born: June 24, 1946

II. Education

Postdoctoral, National Research Council Postdoctoral

Research Fellowship, 1971

Naval Postgraduate School, Monterey, CA 93940

Ph.D., Solid State Physics, 1970

Michigan State University

East Lansing, MI 48823

NDEA Title IV Fellow

Thesis: "The Anisotropic Antiferromagnet Theory and Experiment"

B.S., Physics and Mathematics, 1966

Cum Laude and with Honors

Florida State University

Tallahassee, FL 32306

National Merit Scholar

III. Professional Services/Recognition

Member American Geophysical Union

Member The Oceanography Society

Member American Meteorological Society

Chairman, AMS Committee on Boundary Layers and Turbulence: 1987-1990; member, 1984-1992

Member of the NASA FIRE Science Team: 1987-Present

Member of the HEXOS Science Team: 1983-Present

Member of the National Academy of Sciences Committee on Coastal Meteorology: 1990-1993

Member of the AMS Committee on Meteorology and Oceanography of the Coastal Zone: 1992-1996

Program Chairman of the 9th AMS Symposium on Turbulence and Diffusion, Roskilde: Denmark, May, 1990

Program Co-Chairman of the 2nd International Symposium on Tropospheric Profiling: Boulder, Colorado, September, 1991

General Co-Chairman of the 3rd International Symposium on Tropospheric Profiling: Hamburg, Germany, August, 1994

Associate Editor of Journal of the Atmospheric Sciences: 1991-1994

Member of the SHEBA Science Steering Committee: 1993-1997.

Member of the NSF Coastal Ocean Processes (CoOP) advisory committee: 1991-1994

Adjunct Professor of the Department of Meteorology, Pennsylvania State University: 1989-Present

Member of the TOGA COARE Science Team: 1988-1998

Chairman, ARM Tropical Western Pacific Science Advisory Committee, 1995-2002

Member, International Geophysical Union International Climate Dynamics and Meteorology Working Group A (Boundary Layers and Air-Sea Interaction), 1996-2008.

Member, ARM Science Team Executive Committee, 1997-2001.

Fellow, Cooperative Institute for Research in Environmental Sciences, 1999-Present.

Fellow, American Meteorological Society, elected 2000

Member, UCAR Scientific Programs Evaluation Committee (SPEC), 2001-Present

NOAA Administrator’s Award for Scientific Achievement, 2003

Chair, World Climate Research Program Working Group on Surface Fluxes, 2003-Present

Member, CLIVAR Working Group on High Latitude Fluxes

Awarded, Sverdrup Gold Medal, American Meteorology Society, 2009.

IV. Employment

1967-1970 Teaching and Research Assistant

Michigan State University

1971-1977 Adjunct Professor

Department of Physics and Chemistry

Naval Postgraduate School, Monterey, CA

1978-1983 Principal Staff Member

BDM Corporation

Naval Postgraduate School, Monterey, CA

1982 Visiting Scientist

Riso National Laboratory, Denmark

1983-1985 Assistant Professor of Meteorology

The Pennsylvania State University

1988 Visiting Scientist

Naval Environmental Prediction Research Facility, Monterey, CA

1985-1989 Associate Professor of Meteorology

The Pennsylvania State University

1989-Present NOAA Earth Systems Research Laboratory, Physical Science Division

2001-Present Chief: Weather and Climate Physics Branch, ESRL/PSD

V. Teaching Experience

1969-1970 Michigan State University

Introductory Physics for Engineers

1971 Naval Postgraduate School

Introductory Physics

1976 Monterey Peninsula College

Introductory Physics

1983-1989 The Pennsylvania State University

Introductory Oceanography, Meteorological Instruments, Turbulence, Micrometeorology, Meteorological Statistics, Atmospheric Diffusion

1994 Flinders University, Australia

Short course on air-sea fluxes.

VI. Research Experience

Atmospheric Physics (1975-present)

1. Wet and Dry Deposition

a) Aerosols: Measurement techniques, particle fluxes, dynamic models, source/sink relations.

b) General: Theory of dry deposition, profiles, fluxes, residence times.

c) Air-sea gas transfer: bulk models, flux measurements

2. Atmospheric Optics

a) Turbulence: Scintillation and beam wander, temperature and water vapor structure functions, refractive index structure function, turbulence modeling, relationship to meteorological conditions, inversion and wind-shear effects, shipboard and aircraft measurement techniques, turbulence scaling laws.

b) Aerosols: Measurement and modeling, calculation of optical extinction coefficient, production mechanisms, remote sensing, short and long wave radiation transfer effects.

c) Molecular absorption and scattering: LOWTRAN models.

d) Modeling: Optical propagation parameters from meteorological models.

e) Clouds: Droplet spectra, extinction coefficients, scattering processes, albedo.

3. Boundary Layer Physics

a) Mixed layer models: Dynamics and structure, entrainment, radiative effects.

b) Air-sea interaction: Drag coefficients, wave effects, bulk aerodynamic parameterizations, air-ocean-ice energy coupling, sea spray effects on hurricnes.

c) Fog formation: Aerosol activation, turbulent transport, radiative cooling.

d) Dispersion: Plume models, turbulence properties.

4. Atmospheric EM Propagation

Radar and UHF ducting, evaporation ducts, M-profiles, meteorological modeling.

5. Remote Sensing

a) Ground based Doppler systems: SODAR and RADAR; wind and turbulence measurements; atmospheric effects on performance.

b) Cloud properties: optical thickness, liquid water, cloud turbulence

VII. Recent Research Projects

Surface stress and heat flux in the marginal ice zone.

ONR (Arctic), 3/1/84-2/28/85. C.W. Fairall (PI).

Inertial dissipation methods of obtaining air-sea fluxes.

ONR (Marine Meteorology), 1/1/85-12/31/86. C.W. Fairall (PI).

Dry deposition monitoring and research.

NOAA (ATDL), 5/1/85-4/30/90. C.W. Fairall (PI), D.W. Thompson.

Combined VHF Doppler radar and airborne measurements of atmospheric winds.

NASA(MSFC), 9/30/85-9/29/86. D.W. Thomson (PI), C.W. Fairall.

Long term studies of refractive index structure parameters in the troposphere and stratosphere.

AFOSR, 11/1/85-10/31/87. C.W. Fairall (PI).

Utilizing the CP-2 radar data in study of microburst and non-microburst thunderstorms during MIST.

NSF, 2/1/86-1/31/88. G.S. Forbes (PI), C.W. Fairall.

Turbulence, micrometeorological and signal processing instrumentation for boundary layer studies.

DoD, University Instrumentation Grant Program, 8/15/86-8/15/87. C.W. Fairall (PI).

The marine atmosphere on the fleet scale.

ONR, University Research Initiative, 8/15/86-9/30/91. C.W. Fairall (PI),11 other faculty members.

Air-sea fluxes in the COARE pilot experiment.

NSF, 10/1/89-9/30/91. C.W. Fairall (PI).

Air-sea flux studies during TOGA-COARE.

NOAA CGCP TOGA, 10/1/91-9/30/96. C.W. Fairall (PI).

Boundary-layer interactions and Arctic LEADS.

ONR, 10/1/89-9/30/94. C.W. Fairall (PI), W.D. Neff.

Shipboard measurements of the cloud-capped MBL during ASTEX.

DOE, 10/1/91-9/30/94. R. Kropfli (PI).

Similarity in the Marine atmospheric surface layer.

ONR, 4/1/93-9/30/96. C.W. Fairall (PI).

Shipboard measurements of cloud-radiative properties in the tropical western Pacific.

DOE, 10/1/94-9/30/97. C.W. Fairall (PI), 4 other ETL scientists.

Boundary-layer dynamics and cloud-radiative studies in SHEBA: Development of an atmospheric lidar and a wind profiler.NSF, 5/1/95-9/30/97. C.W. Fairall (PI), C. Grund, and R. Strauch.

Similarity in the marine atmospheric surface layer: The role of surface waves and boundary-layer interactions. ONR, 4/1/96-9/30/99. C.W. Fairall (PI).

Measuring, parameterizing, and modeling atmospheric surface fluxes during SHEBA.

NSF, 6/1/97-5/30/00. E. Andreas (PI). C. Fairall, O. Persson, P. Guest.

Shipboard measurements of cloud-radiative properties in the tropical western Pacific: The Nauru-99 experiment. DOE, 10/1/97-9/30/00. C.W. Fairall (PI), 6 other NOAA scientists.

Toward a definitive determination of air-sea gas exchange.

NOAA CGCP OACES, 10/1/98-9/30/99. J. Butler, C. Fairall, R. Feely, P. Tans, and R. Wanninkhof.

Shipboard monitoring of stratocumulus cloud properties in the PACS region. NOAA CGCP PACS, 6/1/99-9/30/01. C. Fairall (PI) and A. S. Frisch.

Shipboard monitoring of tropical marine cloud properties in the JASMINE region.

NASA FIRE, 5/1/99-4/30/01. C. Fairall (PI) and T. Uttal.

Direct measurement of gas transfer over the open sea: Instrumentation and techniques. J. Hare (PI) and C. Fairall. NOAA OGP Global Carbon Exchange. 5/1/00-4/30/03.

Using SHEBA data to improve regional and global climate models. NSF Polar, 8/1/00-7/31/03. A. Grachev (PI), O. Persson, C. Fairall.

Ship-based cloud and precipitation air-sea interaction studies in EPIC2001. NSF Climate Dynamics, 9/1/00-8/31/03. C. Fairall (PI), T. Uttal, J. Intrieri.

Measurement of the sea-spray droplet distribution at high winds. ONR Marine Meteorology Division, 1/1/02-12/31/04. C. Fairall (PI), A. Grachev

Investigation of Cloud and Precipitation Aspects of Air-Sea Interaction in the Eastern Pacific: Analysis of ETL Ship-Based Data from EPIC2001. NOAA OGP PACS program. 10/1/2003-9/30/2007. C. Fairall (PI), T. Uttal, J. Intrieri.

Shipboard Monitoring of Air-sea Flux and Cloud Processes in the Atlantic and Pacific Oceans. NOAA OGP PACS and Climate Observations programs. 0/1/2003-9/30/2006. C. Fairall (PI), J. Hare.

High Resolution Climate Data From Research and Volunteer Observing Ships. NOAA OCO. 10/1/2004-9/30/2010. C. Fairall (PI).

An Ocean-Atmosphere Sensor Integration System (OASIS). NOAA/NASA NOOP. 10/1/2004-9/30/2010. J. Moisan (PI), C. W. Fairall, J. Hare, W. McGillis.

Ship-based measurements of cloud microphysics and PBL properties in precipitating trade cumulus clouds during Rain In Cumulus over the Ocean (RICO). NSF ATM. 8/1/2004-7/31/2007. C. Fairall (PI), R. Hill, G. Feingold.

Investigation of Surface Flux and Cloud/Precipitation Aspects of Air-Sea Interaction in the Tropical Eastern Atlantic. NOAA OGP CLIVAR. 10/1/2005-9/30/2008. C. Fairall (PI).

Development of Ship-Borne Atmosphere-Ocean Ozone Flux Measurements by the Eddy Correlation Technique. NSF IDEA. 10/1/2005-9/30/2008. D. Helmig (PI), J. Hare, C. Fairall.

Development of an Autonomous System for Direct Measurement of the Flux of CO2 over the Ocean. NOAA OCGP Carbon Cycle. 10/1/2005-9/30/2008. A. A. Grachev (PI), J. Hare, C. Fairall, W. McGillis.

Shipboard Monitoring of Air Sea Flux and Cloud Properties in the Southeast Pacific Stratocumulus Region. NOAA OGP CPPA. 10/1/2005-9/30/2008. C. Fairall (PI), J. Hare.

Evaluation and improvement of spray-modified air-sea enthalpy and momentum flux parameterizations for operational hurricane prediction. NOAA JHT. 10/1/06-9/30/08. J.-W. Bao (PI), C. Fairall, J. Wilczak.

Measurement and Parameterization of Air-Sea Gas Transfer over the Southern Ocean in GasEx-III. NOAA OCGP Carbon Cycle. 10/1/2007-9/30/2010. C. Fairall (PI), J. Hare, W. McGillis.

Evaluation and Improvement of NOAA Climate GCM Air-Sea Interaction Physics: An EPIC/VOCALS Synthesis Project. NOAA OGP CPPA 10/1/2007-9/30//2011. C. Fairall (PI), S. deSzoeke, Y. Chang, S.-P. Xie.

Ship-based Observations of Air-sea Interaction and Stratocumulus Cloud-Aerosol-Drizzle Processes in VOCALS. NOAA OGP CPPA 5/2008-4/2012. C. Fairall (PI), S. deSzoeke, S. Yuter.

A Next-generation Integrated Earth System Analysis – Coupling between the Ocean and Atmosphere. NASA ROSES 2010 NNH10ZDA001N – MAP 2010-2015. Michele Rienecker (PI), C. Fairall.

Collaborative research: Ship-based measurement of air-sea fluxes, the atmospheric boundary layer, and clouds during MJO development. NOAA CPO 2010-2017. Chris Fairall (PI), Simon de Szoeke, Wm. Alan Brewer.

Quantifying the Role of Atmospheric Forcing in Ice Edge Retreat and Advance Including Wind-wave Coupling. ONR 2013-2017. C. Fairall (PI) and O. Persson.

Collaborative Research: PISTON Atmosphere-Ocean Interaction near the Philippines. NOAA CPO 2017-2019. C. Fairall (PI), A. Brewer.

Collaborative Research: Surface Exchange of Climate-Active Trace Gases in a Sea Ice Environment During MOSAiC. NSF 2018-2022. B. Blomquist (PI), S. Archer, C. Fairall.

Observing and Understanding Upper-Ocean Processes and Shallow Convection in the Tropical Atlantic Ocean. NOAA CPO 2019-2021. C. Fairall (PI), A. Brewer.