Curriculum Vitae

Robert G. Ellingson

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General Information

University address: Earth, Ocean & Atmospheric Science
College of Arts and Sciences
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Professional Preparation

1972	Ph.D., Florida State University, Tallahassee, FL. Major: Meteorology.
1968	M.S., Florida State University, Tallahassee, FL. Major: Meteorology.
1967	B.S., Florida State University, Tallahassee, FL. Major: Meteorology.

Professional Experience

2010–present	Professor, Earth, Ocean & Atmospheric Science, Florida State University.
2002–present	Professor Emeritus, Department of Meteorology, University of Maryland, College Park, MD.
2002–2010	Chair, Department of Meteorology, Florida State University.
2002–2010	Professor, Department of Meteorology, Florida State University.
1990–2002	Professor, Department of Meteorology, University of Maryland, College Park, MD.
2000–2001	Associate Director, Earth System Science Interdisciplinary Center, University of Maryland, College Park, MD.
1989–2001	Director, NOAA-UMD Cooperative Institute for Climate Studies,

University of Maryland, College Park, MD.

1999–2000	Acting Chair, Earth System Science Interdisciplinary Center, University of Maryland, College Park, MD. 2-month position.
1991	Director of Graduate Studies, Department of Meteorology, University of Maryland, College Park, MD.
1985–1991	Director of Graduate Studies, Department of Meteorology, University of Maryland, College Park, MD.
1978–1990	Associate Professor, Department of Meteorology, University of Maryland, College Park, MD.
1973–1978	Assistant Professor, Department of Meteorology, University of Maryland, College Park, MD.
1969–1972	Research Assistant, Department of Meteorology, Florida State University. Carried out research on atmospheric radiation on NSF grants.
1968	Teaching Assistant, Department of Meteorology, Florida State University.

Fellowship(s)

National Center for Atmospheric Research Postdoctoral Fellowship (1972–1973).

Honors, Awards, and Prizes

Distinguished Associate Award, U.S. Department of Energy (2006).

> Citation reads: In recognition of your outstanding leadership in the Atmospheric Radiation Measurement (ARM) Program. Your role as a leading architect of the ARM Program was critical to its creation. Your tenure as Chair of the ARM Science Team Executive Committee has provided strong scientific leadership in charting the path forward in achieving the ARM goals. The ARM community and the U.S. Department of Energy appreciate your unselfish service and scientific contributions to the program." The Distinguished Associate Award is DOE's highest award and is given only to those who have made significant accomplishments in their fields.

Fellow, American Meteorological Society (1998).
Distinguished Service Award, U.S. Department of Energy (1995).

Current Membership in Professional Organizations

American Meteorological Society

Teaching

Courses Taught

Radiative Transfer (MET5421)
Advanced Atmosphere Physics I (MET5425)
Atmospheric Physics I (MET4420)
Radiative Transfer (MET5421)
Radiative Transfer (MET5421)
Doctoral Seminar (MET6930)
Master's Seminar (MET5930)
Advanced Atmosphere Physics I (MET5425)
Atmospheric Physics I (MET4420)
Introductory Meteorology Laboratory (MET1010)
Meteorology Internship (MET4945)

Doctoral Committee Chair

Taylor, P. C., graduate. (2009).

Doctoral Committee Cochair

Honeyager, R. E., doctoral student.
Koch, A. M., doctoral student.

Doctoral Committee Member

Ryglicki, D. R., graduate. (2011).
Lin, H., graduate. (2010).
Lin, L., graduate. (2009).
Albers, C. M., doctoral candidate.
Nowell, H. K., doctoral candidate.
Schenkel, B. A., doctoral candidate.
Shin, C. S., doctoral candidate.
You, Y., doctoral candidate.
Shaheen, G., doctoral candidate. (2011).

Master's Committee Chair

Kablick, G. P. I., graduate. (2008). *Third Intercomparison of Radiation Codes in Climate Models: Longwave Cloudy Sky Benchmarks and Comparisons with Approximate Methods*.

Taylor, P., graduate. (2006). *A Study of the Probability of Clear Line of Sight Through Single-Layer Cumulus Cloud Fields in the Tropical Western Pacific*.

McDowall, G., graduate. (2005). *Broadband Solar Irradiances Measured on Fixed and Stabilized Platforms: Comparison of Observations and Their Uncertainties*.

Master's Committee Member

Veenhuis, B. A., graduate. (2009).

Sejas, S. A., student.

Research and Original Creative Work

Publications

Refereed Journal Articles

Kablick, George P., III, Ellingson, R. G., Takara, E. E., & Gu, J. (2011). Longwave 3D Benchmarks for Inhomogeneous Clouds and Comparisons with Approximate Methods. *Journal of Climate*, *24(8)*, 2192-2205. doi:10.1175/2010JCLI3752.1

PT: J; TC: 0; UT: WOS:000290000800011.

Krishnamurti, T. N., Biswas, M. K., Mackey, B. P., Ellingson, R. G., & Ruscher, P. H. (2011). Hurricane forecasts using a suite of large-scale models. *Tellus Series A-Dynamic Meteorology and Oceanography*, *63(4)*, 727-745. doi:10.1111/j.1600-0870.2011.00519.x

PT: J; TC: 0; UT: WOS:000292864500006.

Taylor, P. C., Ellingson, R. G., & Cai, M. (2011). Geographical Distribution of Climate Feedbacks in the NCAR CCSM3.0. *Journal of Climate*, *24(11)*, 2737-2753. doi:10.1175/2010JCLI3788.1

PT: J; TC: 2; UT: WOS:000291507800008.

Taylor, P. C., Ellingson, R. G., & Cai, M. (2011). Seasonal Variations of Climate Feedbacks

in the NCAR CCSM3. *Journal of Climate*, *24(13)*, 3433-3444. doi: 10.1175/2011JCLI3862.1

PT: J; TC: 1; UT: WOS:000292590500018.

Mechem, D. B., Kogan, Y. L., Ovtchinnikov, M., Davis, A. B., Evans, K. F., & Ellingson, R. G. (2008). Multidimensional Longwave Forcing of Boundary Layer Cloud Systems. *Journal of the Atmospheric Sciences*, *65(12)*, 3963-3977. doi: 10.1175/2008JAS2733.1

PT: J; TC: 2; UT: WOS:000261990400019.

Taylor, P. C., & Ellingson, R. G. (2008). A Study of the Probability of Clear Line of Sight through Single-Layer Cumulus Cloud Fields in the Tropical Western Pacific. *Journal of the Atmospheric Sciences*, *65(11)*, 3497-3512. doi:10.1175/2008JAS2620.1

PT: J; TC: 5; UT: WOS:000261073100008.

Lee, Hai-Tien, Gruber, A., Ellingson, R. G., & Laszlo, I. (2007). Development of the HIRS outgoing longwave radiation climate dataset. *JOURNAL OF ATMOSPHERIC AND OCEANIC TECHNOLOGY*, *24(12)*, 2029-2047. doi:10.1175/2007JTECHA989.1

The Advanced Very High Resolution Radiometer (AVHRR) outgoing longwave radiation (OLR) product, which NOAA has been operationally generating since 1979, is a very long data record that has been used in many applications, yet past studies have shown its limitations and several algorithm- related deficiencies. Ellingson et al. have developed the multispectral algorithm that largely improved the accuracy of the narrowband- estimated OLR as well as eliminated the problems in AVHRR. NOAA has been generating High Resolution Infrared Radiation Sounder (HIRS) OLR operationally since September 1998. In recognition of the need for a continuous and long OLR data record that would be consistent with the earth radiation budget broadband measurements in the National Polar- orbiting Operational Environmental Satellite System (NPOESS) era, and to provide a climate data record for global change studies, a vigorous reprocessing of the HIRS radiance for OLR derivation is necessary. This paper describes the development of the new HIRS OLR climate dataset. The HIRS level 1b data from the entire Television and Infrared Observation Satellite N-series (TIROS- N) satellites have been assembled. A new radiance calibration procedure was applied to obtain more accurate and consistent HIRS radiance measurements. The regression coefficients of the HIRS OLR algorithm for all satellites were rederived from calculations using an improved radiative transfer model. Intersatellite calibrations were performed to remove possible discontinuity in the HIRS OLR product from different satellites. A set of global monthly diurnal models was constructed consistent with the HIRS OLR retrievals to reduce the temporal sampling errors and to alleviate an orbital- drift- induced artificial trend. These steps significantly improved the accuracy, continuity, and uniformity of the HIRS monthly mean OLR time series. As a result, the HIRS OLR shows a comparable stability as in the Earth Radiation Budget Satellite.

Cahalan, R., Oreopoulos, L., Marshak, A., Evans, K., Davis, A., Pincus, R., Yetzer, K., Mayer, B., Davies, R., Ackerman, T., Barker, H., Clothiaux, E., Ellingson, R., Garay, M., Kassianov, E., Kinne, S., Macke, A., O'Hirok, W., Partain, P., Prigarin, S., Rublev, A., Stephens, G., Szczap, F., Takara, E., Varnai, T., Wen, G., & Zhuravleva, T. (2005). The 13RC - Bringing together the most advanced radiative transfer tools for cloudy atmospheres. *BULLETIN OF THE AMERICAN METEOROLOGICAL SOCIETY*, *86(9)*, 1275+. doi:10.1175/BAMS-86-9-1275

The interaction of clouds with solar and terrestrial radiation is one of the most important topics of climate research. In recent years it has been recognized that only a full three-dimensional (3D) treatment of this interaction can provide answers to many climate and remote sensing problems, leading to the worldwide development of numerous 3D radiative transfer (RT) codes. The international Intercomparison of 3D Radiation Codes (I3RC), described in this paper, sprung from the natural need to compare the performance of these 3D RT codes used in a variety of current scientific work in the atmospheric sciences. I3RC supports intercomparison and development of both exact and approximate 3D methods in its effort to 1) understand and document the errors/limits of 3D algorithms and their sources; 2) provide "baseline" cases for future code development for 3D radiation; 3) promote sharing and production of 3D radiative tools; 4) derive guidelines for 3D radiative tool selection; and 5) improve atmospheric science education in 3D RT. Results from the two completed phases of I3RC have been presented in two workshops and are expected to guide improvements in both remote sensing and radiative energy budget calculations in cloudy atmospheres.

Turner, D., Tobin, D., Clough, S., Brown, P., Ellingson, R., Mlawer, E., Knuteson, R., Revercomb, H., Shippert, T., Smith, W., & Shephard, M. (2004). The QME AERI LBLRTM: A closure experiment for downwelling high spectral resolution infrared radiance. *JOURNAL OF THE ATMOSPHERIC SCIENCES*, *61(22)*, 2657-2675. doi: 10.1175/JAS3300.1

Research funded by the U. S. Department of Energy's Atmospheric Radiation Measurement (ARM) program has led to significant improvements in longwave radiative transfer modeling over the last decade. These improvements, which have generally come in small incremental changes, were made primarily in the water vapor self- and foreign-broadened continuum and the water vapor absorption line parameters. These changes, when taken as a whole, result in up to a 6 W m(-2) improvement in the modeled clear-sky downwelling longwave radiative flux at the surface and significantly better agreement with spectral observations. This paper provides an overview of the history of ARM with regard to clear-sky longwave radiative transfer, and analyzes remaining related uncertainties in the ARM state-of-the-art Line-by-Line Radiative Transfer Model (LBLRTM). A quality measurement experiment (QME) for the downwelling infrared radiance at the ARM Southern Great Plains site has been ongoing since 1994. This experiment has three objectives: 1) to validate and improve the absorption models and spectral line parameters used in line-by-line radiative transfer models, 2) to assess the ability to define the atmospheric state, and 3) to assess the quality of the radiance observations that serve as ground truth for the model. Analysis of data from 1994 to 1997 made significant contributions to optimizing the QME, but is limited by small but significant uncertainties and deficiencies in the atmospheric state and radiance observations. This paper concentrates on the analysis of QME data from 1998 to 2001, wherein the data have been carefully selected to address the uncertainties in the 1994-97 dataset. Analysis of this newer dataset suggests that the representation of self- broadened water vapor continuum absorption is 3\%-8\% too strong in the 750-1000 cm(-1) region. The dataset also provides information on the accuracy of the self- and foreign-broadened continuum absorption in the 1100-1300 cm(-1) regi.

Ba, M., Ellingson, R., & Gruber, A. (2003). Validation of a technique for estimating OLR with the GOES sounder. *JOURNAL OF ATMOSPHERIC AND OCEANIC TECHNOLOGY*, *20(1)*, 79-89. doi:10.1175/1520-0426(2003)020 [0079:VOATFE>2

In order to eventually use the capability of the Geostationary Operational Environmental Satellite (GOES) Sounder to capture the diurnal signal of outgoing longwave radiation (OLR), it is necessary to establish its instantaneous accuracy. Error characteristics of OLR derived from the GOES Sounder are analyzed using Clouds and Earth's Radiant Energy System (CERES) observations. The comparisons are based on over 28 000 data collected in July 1998 and April 2000 over the continental United States. The July data correspond to observations from GOES-8 and -9 and the CERES instrument on board the Tropical Rainfall Measurement Mission (TRMM) satellite. The

April data correspond to GOES-8 and -10, and two CERES instruments on board the Terra satellite. The comparisons are for instantaneous, homogeneous scenes of 1degreesx1degrees boxes. Comparisons of GOES Sounder with collocated TRMM and Terra CERES OLR show instantaneous rms agreement to within about 7 W m(-2) for day and/or night homogeneous scenes. The GOES technique explained over 91\% and 96\% of the variance of CERES observations for both night and day, and for both land and ocean scenes for July 1998 and April 2000, respectively.

Ellingson, R., & Ba, M. (2003). A study of diurnal variation of OLR from the GOES sounder. *JOURNAL OF ATMOSPHERIC AND OCEANIC TECHNOLOGY*, *20(1)*, 90-98. doi:10.1175/1520-0426(2003)020[0090:ASODVO>2

A multispectral outgoing longwave radiation (OLR) estimation technique is applied to GOES Sounder data to study the diurnal cycle of OLR. OLR data collected from several regional areas over the continental United States and adjacent oceans during July 1998 are analyzed to determine diurnal variations for clear-sky and all-sky conditions. It is found that the desert regions exhibit a diurnal range that can reach up to about 70 W m(-2) while the vegetated areas and ocean regions exhibit much lower diurnal range. The results for this one month show that the form of the monthly diurnal variation of the different regions can be approximated with a sine-like function, with the desert sites exhibiting a more nearly perfect sine curve. It is also found that the rms errors associated with sparse data such as those of polar orbiting satellites depend on sampling time and interval. The high temporal and spatial characteristics of OLR data from geostationary satellites offer a unique opportunity to obtain increased understanding of the diurnal cycles of atmospheric processes.

Lee, H., & Ellingson, R. (2002). Development of a nonlinear statistical method for estimating the downward longwave radiation at the surface from satellite observations. *JOURNAL OF ATMOSPHERIC AND OCEANIC TECHNOLOGY*, *19(10)*, 1500-1515. doi:10.1175/1520-0426(2002)019[1500:DOANSM>2

This paper develops a nonlinear statistical method that uses satellite radiance observations directly to estimate the downward longwave radiation (DLR) at the earth's surface, a necessary component of the surface energy budget. The proposed technique has rms regression errors of about 9 W m(-2) for clear-sky conditions, and about 4 to 8 W m(-2) for overcast conditions, depending on the cloud levels. It is shown that this technique can produce unbiased estimates over a large range of meteorological conditions, which is crucial for climate studies. Sensitivity studies show that the DLR is most sensitive to errors in the cloud amount on average. Overall, the combined errors for an instantaneous DLR estimate, excluding the effects of the surface pressure errors, range from about 7 to 12 W m(-2) when there is a +/-10\% uncertainty in cloud amount and a +/-100 hPa uncertainty in cloud-base pressure. When the cloud amount uncertainty rises to 30\%, the combined DLR error ranges from about 10 to 25 W m(-2). This clear-sky DLR estimation technique was validated preliminarily by using simulated radiation data. The DLR differences between estimated and calculated values have a standard deviation of about 9 W m(-2) and are unbiased in most conditions. The validity of the DLR estimation technique has been demonstrated; however, validation for cloudy conditions, comparison with surface observations, and improvements related to surface pressure dependence and skin temperature discontinuity are left for future study.

Stephens, G., Ellingson, R., Vitko, J., Bolton, W., Tooman, T., Valero, F., Minnis, P., Pilewskie, P., Phipps, G., Sekelsky, S., Carswell, J., Miller, S., Benedetti, A., McCoy, R., McCoy, R., Lederbuhr, A., & Bambha, R. (2000). The Department of Energy's Atmospheric Radiation Measurement (ARM) Unmanned Aerospace Vehicle (UAV) program. *BULLETIN OF THE AMERICAN METEOROLOGICAL SOCIETY*, *81(12)*, 2915-2937. doi:10.1175/1520-0477(2000)081[2915:TDOESA>2

The U.S. Department of Energy has established an unmanned aerospace vehicle (UAV) measurement program. The purpose of this paper is to describe the evolution of the program since its inception, review the progress of the program, summarize the measurement capabilities developed under the program, illustrate key results from the various UAV campaigns carried out to date, and provide a sense of the future direction of the program. The Atmospheric Radiation Measurement (ARM)-UAV program has demonstrated how measurements from unmanned aircraft platforms operating under the various constraints imposed by different science experiments can contribute to our understanding of cloud and radiative processes. The program was first introduced in 1991 and has evolved in the form of four phases of activity each culminating in one or more flight campaigns. A total of 8 flight campaigns produced over 140 h of science flights using three different UAV platforms. The UAV platforms and their capabilities are described as are the various phases of the program development. Examples of data collected from various campaigns highlight the powerful nature of the observing system developed under the auspices of the ARM-UAV program and confirm the viability of the UAV platform for the kinds of research of interest to ARM and the clouds and radiation community as a whole. The specific examples include applications of the data in the study of radiative transfer through clouds, the evaluation of cloud parameterizations, and the development and evaluation of cloud remote sensing methods. A number of notable and novel achievements of the program are also highlighted.

Han, D., & Ellingson, R. (2000). An experimental technique for testing the validity of cumulus cloud parameterizations for longwave radiation calculations. *JOURNAL OF APPLIED METEOROLOGY*, *39(7)*, 1147-1159. doi:10.1175/1520-0450(2000)039[1147:AETFTT>2

Cumulus cloud bulk geometry, size, and spatial distributions have long been recognized as important factors for longwave radiative transfer under broken cloud conditions. Most current climate models, however, still ignore these factors and estimate the effects of broken cumulus clouds as the cloud amount-weighted average of clear and black-cloud overcast conditions, that is, the black plate approximation. Although several groups have adopted the simplicity of the black plate approximation and extended it to include the effects of cloud geometry, cloud size, and spatial distributions by defining an effective cloud fraction, the validity of these parameterizations has long been assumed because of inadequate measurements of the instantaneous atmospheric radiative properties. Now ground-based measurements at the Atmospheric Radiation Measurement Program southern Great Plains Cloud and Radiation Test Bed site allow the derivation of the effective cloud fraction, absolute cloud fraction, cloud aspect ratio, and many other variables characterizing cumulus clouds. Using an empirically determined sampling period of 10 min, several different parameterizations for effective cumulus cloud fraction were tested by comparing effective amounts derived from hemispheric flux observations with values predicted by the parameterizations. Within the range of data and among the models rested, the better results were obtained with the cuboidal model with exponential cloud size and spatial distributions, the random cylinder model, the regular cuboidal model. and the shifted-periodic array cuboidal model. However, there are few cases in the range of greatest sensitivity where model comparisons demonstrate larger disparity.

Takara, E., & Ellingson, R. (2000). Broken cloud field longwave-scattering effects. *JOURNAL OF THE ATMOSPHERIC SCIENCES*, *57(9)*, 1298-1310. doi: 10.1175/1520-0469(2000)057[1298:BCFLSE>2

Throughout most of the shortwave spectrum, atmospheric gases do not absorb the abundant amount of incoming solar radiation. The shortwave-scattering albedo of clouds is very large. The combination of large amounts of incoming solar radiation, low gaseous absorptivity, and large cloud-scattering albedo enables clouds at one level of the atmosphere to affect the shortwave radiative transfer at all other atmospheric levels. Absorption by atmospheric gases is much stronger in the longwave. This localizes the effects of clouds in the longwave. Since longwave absorption is weakest in the window region (8-12 mu m), cloud effects there will have the greatest chance of propagating to other levels of the atmosphere. In partially overcast conditions, individual cloud geometry and optical properties are important factors. Longwave calculations of most GCMs ignore individual cloud geometry. For liquid water clouds, the optical properties of clouds are also ignored. Previous work in the window region by Takara and Ellingson considered opaque clouds with no absorption or emission by atmospheric gases. Under those conditions, the effect of cloud scattering was comparable to cloud geometry. In this work, the comparison of longwave scattering and geometric effects in the window region is improved by including partially transparent clouds and adding absorption and emission by atmospheric gases. The results show that for optically thick water clouds, it is sufficient to model the geometry; scattering can be neglected. The window region errors are less than 5 W m(-2) for fluxes and 0.05 K day(-1) for heating rates. The Rat-plate approximation worked for ice clouds; the window region flux errors are less than 3 W m(-2) with heating rate errors less than 0.05 K day(-1).

Warner, J., & Ellingson, R. (2000). A new narrowband radiation model for water vapor absorption. *JOURNAL OF THE ATMOSPHERIC SCIENCES*, *57(10)*, 1481-1496. doi:10.1175/1520-0469(2000)057[1481:ANNRMF>2

The accuracy of radiation models is a critical issue in climate studies. However, calculations from different radiation models used in climate calculations disagree with one another, and with more detailed models, at levels significant to many climate problems. With several new advances in the field of radiation modeling, it is possible to develop more accurate band models and validate them against radiation observations of known high accuracy. In this paper, a new accurate narrowband longwave radiative transfer model for clear-sky conditions is developed. In the first part of this study, only water vapor effects are included, and the model results are tested against line-by-line radiative transfer model (LBLRTM) calculations. In the model development, it is first shown that traditional techniques for estimating Malkmus statistical model parameters from the line compilation and line-by-line models cannot be trusted to give accurate transmittance function. A new technique is then described that calculates water vapor line transmittances with good agreement with LBLRTM calculations (i.e., with rms errors less than 0.01 for more than 97\% of the intervals). The water vapor continuum is included in a manner consistent with the water vapor line absorption. Fluxes calculated with the model agree with LBLRTM to about 1 W m(-2) for the entire vertical range of the atmosphere for several test cases. The heating rate errors are reduced by as much as 0.25 degrees C day(-1) below the tropopause For the test cases compared with the original narrowband model.

Soden, B., Tjemkes, S., Schmetz, J., Saunders, R., Bates, J., Ellingson, R. G., Engelen, R., Garand, L., Jackson, D., Jedlovec, G., Kleespies, T., Koenig, M., Randel, D., Rayer, P., Salathe, E., Schwarzkopf, D., Scott, N., Sohn, B., de Souza-Machado, S., Strow, L., Tobin, D., Turner, D., van Delst, P., & Wehr, T. (2000). An intercomparison of radiation codes for retrieving upper tropospheric humidity in the 6.3-micron band: A report from the 1st GVaP Workshop. *Bulletin of the American Meteorological Society*, *81*, 797-808.

Han, D., & Ellingson, R. (1999). Cumulus cloud formulations for longwave radiation calculations. *JOURNAL OF THE ATMOSPHERIC SCIENCES*, *56(6)*, 837-851. doi: 10.1175/1520-0469(1999)056[0837:CCFFLR>2

Longwave radiative transfer under broken cloud conditions is often treated as a problem in cloud bulk geometry, especially for cumulus clouds, because individual clouds are nearly black. However, climate models ignore cloud geometry and estimate the effects of broken cumulus clouds as the cloud amount weighted average of clear and black cloud overcast conditions (i.e., the black plate approximation). To overcome the simplicity of the black plate approximation, the authors developed a more generalized form of cloud geometrical effects on the effective cloud fraction. Following previous work, this form includes parameters that allow a more precise specification of cloud size and spatial distributions. The sensitivity of the generalized form to the variation in cloud size and spatial distributions is discussed in relation to others. Model calculations show that cloud bulk geometrical shapes, aspect ratio, size distribution, and side inclination angle are the primary factors significantly affecting the effective cloud fraction. These parameters are important at all cloud amounts with greatest sensitivity when the cloud amount is between 0.2 and 0.8. On the other hand, cloud spatial distributions do not significantly influence the effective cloud fraction when absolute cloud amount is less than 0.2 and/or when the cloud aspect ratio is less than 0.5. However, in the range of greatest sensitivity with large aspect ratio and absolute amount, model comparisons show large intermodel differences. The model discussed herein is cloud size dependent and applies most directly to small cumulus clouds (i.e., clouds small compared to the area under consideration).

Stamnes, K., Ellingson, R., Curry, J., Walsh, J., & Zak, B. (1999). Review of science issues, deployment strategy, and status for the ARM North Slope of Alaska-Adjacent Arctic Ocean climate research site. *JOURNAL OF CLIMATE*, *12(1)*, 46-63. doi: 10.1175/1520-0442-12.1.46

Recent climate modeling results point to the Arctic as a region that is particularly sensitive to global climate change. The Arctic warming predicted by the models to result from the expected doubling of atmospheric carbon dioxide is two to three times the predicted mean global warming, and considerably greater than the warming predicted for the Antarctic. The North Slope of Alaska-Adjacent Arctic Ocean (NSA-AAO) Cloud and Radiation Testbed (CART) site of the Atmospheric Radiation Measurement (ARM) Program is designed to collect data on temperature-ice-albedo and water vapor-cloud-radiation feedbacks, which are believed to be important to the predicted enhanced warming in the Arctic. The most important scientific issues of Arctic, as well as global, significance to be addressed at the NSA-AAO CART site are discussed, and a bl icf overview of the current approach toward, and status of, site development is provided. ARM radiometric and remote sensing instrumentation is already deployed and taking data in the perennial Arctic ice pack as part of the SHEBA (Surface l-leat Budget of the Arctic Ocean) experiment. in parallel with ARM's participation in SHEBA, the NSA-AAO facility near Barrow was formally dedicated on 1 July 1997 and began routine data collection early in 1998. This schedule permits the U.S. Department of Energy's ARM Program, NASA's Arctic Cloud program, and the SHEBA program (funded primarily by the National Science Foundation and the Office of Naval Research) to be mutually supportive. In addition, location of the NSA-AAO Barrow facility on National Oceanic and Atmospheric Administration land immediately adjacent to its Climate Monitoring and Diagnostic Laboratory Barrow Observatory includes NOAA in this major interagency Arctic collaboration.

Tobin, D., Best, F., Brown, P., Clough, S., Dedecker, R., Ellingson, R., Garcia, R., Howell, H., Knuteson, R., Mlawer, E., Revercomb, H., Short, J., van Delst, P., & Walden, V. (1999). Downwelling spectral radiance observations at the SHEBA ice station: Water vapor continuum measurements from 17 to 26 mu m. *JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES*, *104(D2)*, 2081-2092. doi: 10.1029/1998JD200057

Earth loses energy to space in the form of longwave (or infrared) radiation. Much of this energy is radiated through the transparent portion of the water vapor rotational band from 17 to 33 mu m (300 to 600 cm(-1)). Very few measurements have been made in this spectral region to characterize how water vapor absorbs and emits longwave radiation. An Atmospheric Emitted Radiance Interferometer (AERI) with extended longwave spectral coverage has been deployed at the Surface Heat Budget of the Arctic Ocean (SHEBA) ice station 300 miles north of the Alaskan coast to measure downwelling radiances at wavelengths of 3 to 26 mu m (380 to 3000 cm(-1)). The spectral and radiometric performance of the instrument, installation at the ice station, and initial. observations are shown. Comparisons to line-by-line radiative transfer calculations for selected clear-sky cases are presented, and air-broadened water vapor continuum absorption coefficients are determined in the wing of the pure rotational band from 17 to 26 mu m (380 to 600 cm(-1)). Comparisons of the coefficients with the widely used Clough Kneizys Davies (CKD) water vapor continuum model suggest empirical modifications to this model are necessary. Comparisons to laboratory measurements of Burch et al. [1974] made at room temperature suggests little or no temperature dependence of the continuum from 400 to 550 cm(-1). Implications of these modifications on top-of-atmosphere and surface fluxes, as well as atmospheric cooling rates, are discussed.

Walden, V., Warren, S., Murcray, F., & Ellingson, R. (1997). Infrared radiance spectra for testing radiative transfer models in cold and dry atmospheres: Test cases from the Antarctic Plateau. *BULLETIN OF THE AMERICAN METEOROLOGICAL SOCIETY*, *78(10)*, 2246-2247.

Baer, F., Arsky, N., Charney, J. J., & Ellingson, R. G. (1997). Intercomparison of heating rates generated by global climate model longwave radiation codes. *JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES*, *102(D21)*, 26589-26603. doi: 10.1029/96JD03903

Ellingson, R. G. (1997). Preface to Satellite data applications: Weather and climate. *Advances in Space Research*, *19*, 405-406.

Valero, F., Pope, S., Ellingson, R., Strawa, A., & Vitko, J. (1996). Determination of clear-sky radiative flux profiles, heating Rates and optical depths using unmanned aerospace vehicles as a platform. *JOURNAL OF ATMOSPHERIC AND OCEANIC TECHNOLOGY*, *13(5)*, 1024-1030. doi:10.1175/1520-0426(1996)013[1024:DOCSRF>2

In this paper the authors report results obtained using an unmanned aerospace vehicle (UAV) as an experimental platform for atmospheric radiative transfer research. These are the first ever climate measurements made from a UAV and represent a major step forward in realizing the unique potential of long-endurance, high-altitude UAVs to contribute to climate and environmental studies. Furthermore, the radiative flux divergences determined during these experiments are some of the highest quality measurements of this kind obtained from any type of aircraft and constitute an important test of radiative transfer models.

Ellingson, R., & Wiscombe, W. (1996). The spectral radiance experiment (SPECTRE): Project description and sample results. *BULLETIN OF THE AMERICAN METEOROLOGICAL SOCIETY*, *77(9)*, 1967-1985. doi:10.1175/1520-0477(1996)077[1967:TSREPD>2

The fundamental climatic role of radiative processes has spurred the development of increasingly sophisticated models of radiative transfer in the earth-atmosphere system. Since the basic physics of radiative transfer is rather well known, this was thought to be an exercise in refinement. Therefore, it came as a great surprise when large differences (30-70 W m(-2)) were found among longwave infrared fluxes predicted by over 30 radiation models for identical atmospheres during the intercomparison of radiation codes used in climate models (ICRCCM) exercise in the mid-1980s. No amount of further calculation could explain these and other intermodel differences; thus, it became clear that what was needed was a set of accurate atmospheric spectral radiation data measured simultaneously with the important radiative properties of the atmosphere like temperature and humidity. To obtain this dataset, the ICRCCM participants charged the authors to develop an experimental field program. So, the authors developed a program concept for the Spectral Radiance Experiment (SPECTRE), organized a team of scientists with expertise in atmospheric field spectroscopy, remote sensing, and radiative transfer, and secured funding from the Department of Energy and the National Aeronautics and Space Administration. The goal of SPECTRE was to establish a reference standard against which to compare models and also to drastically reduce the uncertainties in humidity, aerosol, etc., which radiation modelers had invoked in the past to excuse disagreements with observations. To avoid the high cost and sampling problems associated with aircraft, SPECTRE was designed to be a surface-based program. The field portion of SPECTRE took place 13 November to 7 December

1991, in Coffeyville, Kansas, in conjunction with the FIRE Cirrus II field program, and most of the data have been calibrated to a usable form and will soon appear on a CD-ROM. This paper provides an overview of the data obtained; it also outli.

Takara, E., & Ellingson, R. (1996). Scattering effects on longwave fluxes in broken cloud fields. *JOURNAL OF THE ATMOSPHERIC SCIENCES*, *53(10)*, 1464-1476. doi: 10.1175/1520-0469(1996)053[1464:SEOLFI>2

General circulation models use the hat black plate approximation to calculate longwave radiative transfer through broken cloud fields. This neglects both cloud geometry and longwave optical properties. It is known that cloud geometry is important in longwave transmission. Since the longwave single scattering albedo is as high as 0.75, it is also necessary to determine the importance of scattering effects. A Monte Carlo simulation was used to compute the upward and downward fluxes for simplified cloud fields with a range of cloud geometries and optical properties. Based on these fluxes, the effective cloud fractions were found. The results show that scattering can have a significant effect on fluxes and effective cloud fractions. The effects are largest for low cloud upward fluxes and high cloud downward fluxes. To attain high percentage accuracy, it is necessary to model both cloud geometry and scattering.

Baer, F., Arsky, N., Charney, J. J., & Ellingson, R. G. (1996). Sensitivity of heating rates from global climate model radiation codes. *Journal of Geophysical Research*, *101 (D21)*, 26589-26603.

ELLINGSON, R. (1995). SURFACE LONGWAVE FLUXES FROM SATELLITE-OBSERVATIONS - A CRITICAL-REVIEW. *REMOTE SENSING OF ENVIRONMENT*, *51(1)*, 89-97. doi:10.1016/0034-4257(94)00067-W

ISLSCP (International Satellite Land Surface Climatology Project) Workshop, COLUMBIA, MD, JUN 23-26, 1992.

SELLERS, P., MEESON, B., HALL, F., ASRAR, G., MURPHY, R., SCHIFFER, R., BRETHERTON, F., DICKINSON, R., ELLINGSON, R., FIELD, C., HUEMMRICH, K., JUSTICE, C., MELACK, J., ROULET, N., SCHIMEL, D., & TRY, P. (1995). REMOTE-SENSING OF THE LAND-SURFACE FOR STUDIES OF GLOBAL CHANGE - MODELS, ALGORITHMS, EXPERIMENTS. *REMOTE SENSING OF ENVIRONMENT*, *51(1)*, 3-26. doi: 10.1016/0034-4257(94)00061-Q

The ISLSCP Workshop was held in Columbia Maryland, 23-26 June 1992 with over 240 scientists and science managers attending. The goal was to assess the progress of the East decade in the areas of modeling, satellite data algorithm development, and field experiments. This article includes: 1. A review of the state and direction of biosphere-atmosphere model development and an assessment of the data needs of the models. Models covering a large range of timescales were considered: energy-water-carbon (seconds to seasons); carbon cycles and biogeochemistry (days to years); and ecological structure and function (years to millennia). 2. A reference to current satellite data algorithms and other global data sources. The areas covered in the workshop were: near-surface meteorology, surface radiation budget, precipitation, runoff; snow and ice, soils and soil moisture, and land cover type and land cover attributes. These are discussed in detail in other articles in this issue. 3. A review of completed and planned major field experiments. The major experiments of the last decade are summarized and the lessons noted, The participating scientists agreed on the need to rapidly assemble and circulate global data sets of variables and parameters required to initialize, force, and validate the global biosphere-atmosphere models. A prioritized list of data sets required to meet this need is set out and discussed. Lastly, initiatives taken by ISLSCP to satisfy these requirements are reviewed: Initiative I: Immediate Generation of High Priority Global Data Sets Some essential global data sets are to be put together within 2 years and released to the community by mid-1994. These data sets will be mapped to a common spatial resolution (1 degrees x 1 degrees) and will cover the period 1987-1988. 1. Vegetation: Global sets of vegetation-related parameters are to be generated with a monthly time resolution. Available AVHRR data sets are to be I used as the basis for this effort, and algorit.

KILLEN, R., & ELLINGSON, R. (1994). THE EFFECT OF SHAPE AND SPATIAL-DISTRIBUTION OF CUMULUS CLOUDS ON LONGWAVE IRRADIANCE. *JOURNAL OF THE ATMOSPHERIC SCIENCES*, *51(14)*, 2123-2136. doi: 10.1175/1520-0469(1994)051[2123:TEOSAS>2

In the longwave part of the spectrum, clouds are generally modeled in GCMs as flat black plates. The true effective cloud cover for transmittance of infrared radiation may be larger or smaller than the fractional cloud cover normal to the surface because of emittance of radiation from the sides of clouds into the clear sky and because the sides may have a finite cross section normal to the view and a vertical thermal gradient. The authors have derived the effective cloud cover as a function of zenith angle in terms of the cloud cover normal to the surface for several models of cumulus clouds with measured spatial and size distributions as a function of aspect ratio (height to radius or half-width) and shape. The effective cloud cover is shown as a function of cloud shape and aspect ratio as well as spatial distribution. The effective cloud cover is also sensitive to the thermal gradient between the cloud top and its base.

ELLINGSON, R., LEE, H., YANUK, D., & GRUBER, A. (1994). VALIDATION OF A TECHNIQUE FOR ESTIMATING OUTGOING LONGWAVE RADIATION FROM HIRS RADIANCE OBSERVATIONS. *JOURNAL OF ATMOSPHERIC AND OCEANIC TECHNOLOGY*, *11(2, 1)*, 357-365. doi:10.1175/1520-0426(1994)011[0357:VOATFE>2

Simultaneous observations by the Earth Radiation Budget Experiment (ERBE) scanning radiometer and the High-Resolution Infrared Sounder (HIRS) on board the NOAA-9 spacecraft have been used to validate a multispectral technique for estimating the outgoing longwave radiation (OLR) from the earth-atmosphere system. Results from approximately 100 000 collocated observations show that the HIRS technique provides instantaneous OLR estimates that agree with the ERBE observations just as well as different ERBE scanners agree with each other-about 5 W m-2 rms. Although there are differences between the HIRS and ERBE estimates that depend upon the scene type and time of day, the HIRS technique explained more than 99\% of the variance of the ERBE observations for both day and night observations. The results suggest that the HIRS OLR technique is a suitable replacement for the Advanced Very High Resolution Radiometer technique now used by the National Oceanic and Atmospheric Administration for operational estimates of the OLR.

Ellingson, R. G., Yanuk, D., Gruber, A., & Miller, A. J. (1994). Development and Application of Remote Sensing of Longwave Cooling from the NOAA Polar Orbiting Satellites. *Journal of Photogrammetric Engineering and Remote Sensing*, *60*, 307-316.

Gruber, A., Ellingson, R. G., Ardanuy, P., Weiss, M., Yang, S. K., & Oh, S. (1994). A Comparison of ERBE and AVHRR Longwave Flux Estimates. *Bulletin of the American Meteorological Society*, *75*, 2115-2130.

Wang, W-C., London, J., Isaksen, I., Shine, K., Ellingson, R. G., & Taylor, F. (1992).

Summary report of the IUGG-IAMAP Workshop MW5: Climatic effect of atmospheric trace constituents. *Bulletin of the American Meteorological Society*, *73*, 801-804.

ELLINGSON, R., ELLIS, J., & FELS, S. (1991). THE INTERCOMPARISON OF RADIATION CODES USED IN CLIMATE MODELS - LONG-WAVE RESULTS. *JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES*, *96(D5)*, 8929-8953. doi:10.1029/90JD01450

An international program of intercomparison of radiation codes used in climate models has been initiated because of the central role of radiative processes in many proposed climate change mechanisms. During the past 6 years, results of calculations from such radiation codes have been compared with each other, with results from the most detailed radiation models (line-by-line models) and with observations from within the atmosphere. Line-by-line model results tend to agree with each other to within 1\%; however, the intercomparison shows a spread of 10-20\% in the calculations of radiation budget components by the less detailed climate model codes. The spread among the results is even larger (30-40\%) for the sensitivities of the codes to changes in radiatively important variables, such as carbon dioxide and water vapor. The analysis of the model calculations shows that the outliers to many of the clear-sky calculations appear to be related to those models that have not tested the techniques used to perform the integration over altitude. When those outliers are removed, the agreement between narrow band models and the line-by-line models is about +/- 2\% for fluxes at the atmospheric boundaries, about +/- 5\% for the flux divergence for the troposphere, and to about +/- 5\% for the change of the net flux at the tropopause as CO2 doubles. However, this good agreement does not extend to the majority of the models currently used in climate models. The lack of highly accurate flux observations from within the atmosphere has made it necessary to rely on line-by-line model results for evaluating model accuracy. As the intercomparison project has proceeded, the number of models agreeing more closely with the line-by-line results has increased as the understanding of the various parameterizations has improved and as coding errors have been discovered. The most recent results indicate that several climate model techniques are in the marginal range of (relative) accuracy for l.

ELLINGSON, R., ELLIS, J., & FELS, S. (1991). THE INTERCOMPARISON OF RADIATION CODES USED IN CLIMATE MODELS - LONG-WAVE RESULTS. *JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES*, *96(D5)*, 8929-8953. doi:10.1029/90JD01450

An international program of intercomparison of radiation codes used in climate models has been initiated because of the central role of radiative processes in many proposed climate change mechanisms. During the past 6 years, results of calculations from such radiation codes have been compared with each other, with results from the most detailed radiation models (line-by-line models) and with observations from within the atmosphere. Line-by-line model results tend to agree with each other to within 1\%; however, the intercomparison shows a spread of 10-20\% in the calculations of radiation budget components by the less detailed climate model codes. The spread among the results is even larger (30-40\%) for the sensitivities of the codes to changes in radiatively important variables, such as carbon dioxide and water vapor. The analysis of the model calculations shows that the outliers to many of the clear-sky calculations appear to be related to those models that have not tested the techniques used to perform the integration over altitude. When those outliers are removed, the agreement between narrow band models and the line-by-line models is about +/- 2\% for fluxes at the atmospheric boundaries, about +/- 5\% for the flux divergence for the troposphere, and to about +/- 5\% for the change of the net flux at the tropopause as CO2 doubles. However, this good agreement does not extend to the majority of the models currently used in climate models. The lack of highly accurate flux observations from within the atmosphere has made it necessary to rely on line-by-line model results for evaluating model accuracy. As the intercomparison project has proceeded, the number of models agreeing more closely with the line-by-line results has increased as the understanding of the various parameterizations has improved and

as coding errors have been discovered. The most recent results indicate that several climate model techniques are in the marginal range of (relative) accuracy for l.

ELLINGSON, R., & FOUQUART, Y. (1991). THE INTERCOMPARISON OF RADIATION CODES IN CLIMATE MODELS - AN OVERVIEW. *JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES*, *96(D5)*, 8925-8927. doi: 10.1029/90JD01618

The recognition of the central role of radiative processes in many proposed climate change mechanisms and the perception of possibly significant uncertainties in the estimates of these fundamental processes led the Joint Scientific Committee of the World Climate Research Programme and the International Radiation Commission of the International Association of Meterology and Atmospheric Physics to initiate the international Intercomparison of Radiation Codes in Climate Models (ICRCCM). The results from model calculations with specified clear-and-cloudy conditions show that many radiation algorithms may have unidentifiable but large errors that may significantly affect the conclusions of the studies in which they are used. This is true for climate modeling but may also be the case for other applications such as the estimation of radiation fluxes at the surface from satellite observations. As the study has progressed over a 4-year period, there has been a narrowing of results as errors were found in some codes and as the understanding of many modeling problems increased. Many of the results, particularly for clear-sky conditions, indicate that we are close to the range of (relative) accuracy for calculating flux quantities necessary for many climate programs. However, not all models will give such accuracy. It is recommended that the ICRCCM test cases be used to test radiation algorithms prior to their application to climate-related problems. The participants feel that the rather large discrepancies revealed during ICRCCM cannot be decisively resolved by further calculation. Therefore the group recommends the organization of a program to simultaneously measure spectral radiance at high spectral resolution along with the atmospheric data necessary to calculate radiances.

Ellingson, R. G., Yanuk, D. J., & Gruber, A. (1989). Effects of the Choice of Meteorological Data on a Radiation Model Simulation of the NOAA Technique for Estimating Outgoing Longwave Radiation from Satellite Radiance Observations. *JOURNAL OF CLIMATE*, *2(8)*, 761-765. doi:10.1175/1520-0442(1989)002[0761:EOTCOM>2

The technique used by NOAA to estimate the outgoing longwave flux from 10 mu m window radiance observations has been reexamined because the data that result from the application of the empirically determined regression equation are systematically lower than those obtained from regression models based on earlier radiative transfer calculations. A new set of radiation calculations was made from a set of 1600 atmospheric soundings and the resulting regression equation gives flux differences from the empirical model that are of the order of +/- 5 W m(-2) over the range of 150 to 300 W m(-2), as compared to the +10 W m(-2) systematic differences from previous studies. The differences are attributed to the size and representativeness of the sample of soundings used in the radiation calculations. The results also show that although the explained variance of the regression is of the order of 95\%, this type of estimation technique may make errors of +/- 20 W m(-2) or larger for a given radiance observation. This will lead to biased average flux estimates in geographical regions where the temperature and moisture profiles change little over extended time periods.

Ellingson, R. G., Yanuk, D. J., Lee, H-T., & Gruber, A. (1989). A technique for estimating outgoing longwave radiation from HIRS radiance observations. *Journal of Atmospheric Oceanic Technology*, *6*, 706-711.

VOGELMANN, A., ROBOCK, A., & ELLINGSON, R. (1988). EFFECTS OF DIRTY SNOW IN NUCLEAR WINTER SIMULATIONS. *JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES*, *93(D5)*, 5319-5332. doi:10.1029/

JD093iD05p05319

LUTHER, F., ELLINGSON, R., FOUQUART, Y., FELS, S., SCOTT, N., & WISCOMBE, W. (1988). INTERCOMPARISON OF RADIATION CODES IN CLIMATE MODELS (ICRCCM) - LONGWAVE CLEAR-SKY RESULTS - A WORKSHOP SUMMARY. *BULLETIN OF THE AMERICAN METEOROLOGICAL SOCIETY*, *69(1)*, 40-48.

YANUK, D., & ELLINGSON, R. (1986). AN EXTENSION OF THE COLUMN MODEL TECHNIQUE FOR ESTIMATING OUTGOING LONGWAVE IRRADIANCE - THE COLUMN WEIGHTING MODEL. *JOURNAL OF CLIMATE AND APPLIED METEOROLOGY*, *25(9)*, 1231-1240. doi: 10.1175/1520-0450(1986)025[1231:AEOTCM>2

ELLINGSON, R., & SERAFINO, G. (1984). OBSERVATIONS AND CALCULATIONS OF AEROSOL HEATING OVER THE ARABIAN SEA DURING MONEX. *JOURNAL OF THE ATMOSPHERIC SCIENCES*, *41(4)*, 575-589. doi: 10.1175/1520-0469(1984)041[0575:OACOAH>2

Ohring, G., Gruber, A., & ELLINGSON, R. (1984). Satellite determinations of the relationship between total longwave radiation flux and infrared window radiance. *JOURNAL OF CLIMATE AND APPLIED METEOROLOGY*, *23*, 416-425.

ELLINGSON, R. G., & FERRARO, R. (1983). AN EXAMINATION OF A TECHNIQUE FOR ESTIMATING THE LONGWAVE RADIATION BUDGET FROM SATELLITE RADIANCE OBSERVATIONS. *JOURNAL OF CLIMATE AND APPLIED METEOROLOGY*, *22(8)*, 1416-1423. doi:10.1175/1520-0450 (1983)022[1416:AEOATF>2

ELLINGSON, R. (1982). ON THE EFFECTS OF CUMULUS DIMENSIONS ON LONGWAVE IRRADIANCE AND HEATING RATE CALCULATIONS. *JOURNAL OF THE ATMOSPHERIC SCIENCES*, *39(4)*, 886-896. doi: 10.1175/1520-0469(1982)039[0886:OTEOCD>2

ELLINGSON, R. G. (1982). A NOTE ON ERRORS AND UNCERTAINTIES IN NCAR AIRCRAFT PYRGEOMETER DATA FROM MONEX. *BULLETIN OF THE AMERICAN METEOROLOGICAL SOCIETY*, *63(12)*, 1387-1389.

ELLINGSON, R., & GILLE, J. (1978). INFRARED RADIATIVE-TRANSFER MODEL . 1. MODEL DESCRIPTION AND COMPARISON OF OBSERVATIONS WITH CALCULATIONS. *JOURNAL OF THE ATMOSPHERIC SCIENCES*, *35(3)*, 523-545. doi:10.1175/1520-0469(1978)035[0523:AIRTMP>2

ELLINGSON, R., & KOLCZYNSKI, E. (1978). EFFECTS OF CUMULUS DIMENSIONS ON LONG-WAVE IRRADIANCE AND HEATING RATE CALCULATIONS. *BULLETIN OF THE AMERICAN METEOROLOGICAL SOCIETY*, *59(4)*, 483-484.

GILLE, J., & ELLINGSO, R. (1968). CORRECTION OF RANDOM EXPONENTIAL BAND TRANSMISSIONS FOR DOPPLER EFFECTS. *APPLIED OPTICS*, *7(3)*, 471-&. doi:10.1364/AO.7.000471

Invited Book Chapters

Ellingson, R. G., & Takara, E. E. (2005). Longwave Radiative Transfer in Inhomogeneous Cloud Layers. In Marshak, S., & Davis, A. B. (Eds.), *Three Dimensional Radiative Transfer* (pp. 487-519). Springer, New York.

Refereed Proceedings

Taylor, P. C., & Ellingson, R. G. (2009). On the Use of Probability of Clear Line of Sight Models in Parameterizing Surface Downwelling Longwave Radiation in the Tropical Western Pacific. In Teruyuki Nakajima, & Marcia A. Yamasoe (Eds.), *International Radiation Symposium (IRC/IAMAS), Foz do Iguaçu, Brazil*. American Institute of Physics Press.

Ba, M., Ellingson, R., & Gruber, A. (2004). Enhancement of ERBS data by using data from sounders onboard NPP/NPOESS and METOP satellites. In Schlussel, P, Stuhlmann, R, Campbell, JW, & Erickson, C (Eds.), *CLIMATE CHANGE PROCESSES IN THE STRATOSPHERE, EARTH-ATMOSPHERE-OCEAN SYSTEMS, AND OCEANOGRAPHIC PROCESSES FROM SATELLITE DATA* (pp. 1132-1135). 2nd World Space Congress/34th COSPAR Scientific Assembly, HOUSTON, TX. Retrieved from http://dx.doi.org/10.1016/S0273-1177(03)00751-8

2nd World Space Congress/34th COSPAR Scientific Assembly, HOUSTON, TX, OCT 10-19, 2002.

Lee, H., Heidinger, A., Gruber, A., & Ellingson, R. (2004). The HIRS outgoing longwave radiation product from hybrid polar and geosynchronous satellite observations. In Schlussel, P, Stuhlmann, R, Campbell, JW, & Erickson, C (Eds.), *CLIMATE CHANGE PROCESSES IN THE STRATOSPHERE, EARTH-ATMOSPHERE-OCEAN SYSTEMS, AND OCEANOGRAPHIC PROCESSES FROM SATELLITE DATA* (pp. 1120-1124). 2nd World Space Congress/34th COSPAR Scientific Assembly, HOUSTON, TX. Retrieved from http://dx.doi.org/10.1016/S0273-1177(03)00750-6

2nd World Space Congress/34th COSPAR Scientific Assembly, HOUSTON, TX, OCT 10-19, 2002.

Contracts and Grants

Contracts and Grants Funded

Krishnamurti, Tiruvalam N (PI), & Ellingson, R. G. (Nov 2010–Jun 2012). *Tasks to Support FY10 NOAA Hurricane Forecast Improvemen*. Funded by University Corp for Atmos Res. (Z11-68143). Total award $138,300.

Krishnamurti, Tiruvalam N (PI), & Ellingson, R. G. (Apr 2010–Oct 2011). *Field Phase Forecasting for GRIP*. Funded by National Aeronautics & Space A. Total award $35,124.

Krishnamurti, Tiruvalam N (PI), & Ellingson, R. G. (Mar 2010–Mar 2013). *Use of Improved TRMM Algorithms for Downscaling, Medium*. Funded by National Aeronautics & Space A. (NNX10AG86G). Total award $360,077.

Krishnamurti, Tiruvalam N (PI), & Ellingson, R. G. (Nov 2009–Jun 2010). *Ensembles for Hurricane Forecasts from a Suite of Mescos*. Funded by Science Applications SAIC. Total award $69,778.

Krishnamurti, Tiruvalam N (PI), & Ellingson, R. G. (Aug 2009–Jul 2012). *Observational and Modeling Study of Pollution over Asia*. Funded by National Aeronautics & Space A. (NNX09AL41H). Total award $90,000.

Krishnamurti, Tiruvalam N (PI), & Ellingson, R. G. (Jul 2009–Dec 2012). *Numerical Simulations of NASA Research Instrumentation*. Funded by National Aeronautics & Space A. (NNX09AJ15H). Total award $90,000.

Krishnamurti, Tiruvalam N (PI), & Ellingson, R. G. (Mar 2009–Nov 2009). *Ensemble Forecasts from a Suite of Mesoscale Models*. Funded by Science Applications SAIC. Total award $80,004.

Krishnamurti, Tiruvalam N (PI), & Ellingson, R. G. (Nov 2008–May 2013). *Hurricane Genesis, Assimilation, High Resolution*. Funded by National Aeronautics & Space A. (NNX09AC37G). Total award $482,810.

Krishnamurti, Tiruvalam N (PI), & Ellingson, R. G. (Jan 2008–Jan 2010). *Modeling with LASE/NAMMA*. Funded by National Aeronautics & Space A. Total award $77,086.

Erlebacher, Gordon (PI), Shih, C., Wilgenbusch, J. C., Ellingson, R. G., & Chassignet, E. P. (Jul 2007–Jun 2010). *MRI: Acquisition of a Stereographic Projection System*. Funded by National Science Foundation. Total award $263,309.

Ellingson, Robert G (PI). (Jul 2006–May 2010). *FIU - Phase II - Appointments*. Funded by Florida International Univ. Total award $625,329.

Ellingson, Robert G (PI), Krishnamurti, T. N., & Zou, X. (Jun 2006–May 2010). *The Florida Hurricane Research Alliance*. Funded by Florida International Univ. Total award $283,125.

Ellingson, Robert G (PI). (Feb 2006–Jul 2007). *Cloud And Aerosol Properties From Whole Sky Imagery*. Funded by Argonne National Laboratory. Total award $88,482.

Ellingson, Robert G (PI), Krishnamurti, T. N., & Zou, X. (Aug 2004–Aug 2009). *Understanding the Structure and Improved Prediction of H*. Funded by Florida International Univ. Total award $1,350,719.

Service

Florida State University

FSU University Service

Committee Chair, Building Committee for the new EOAS Building (2010–present).

Working with University, College and department stakeholders to help design the new building.

FSU Representative, Member representative to the University Corporation for Atmospheric Research (UCAR) (2002–present).

Represent the University's interests in UCAR activities at their annual meeting.

FSU College Service

member and Chair, Science Area Chairs And Directors Committee (2002–2010).

FSU Department Service

Meteorology representative, EOAS Executive Committee (2010–present).

The Profession

Reviewer or Panelist for Grant Applications

U.S. Department of Energy (2010–2011).

Member, U.S. DOE Atmospheric System Research Proposal Review Panel.

U.S. DOE Office of Science (2010).

member, merit review panel for the Office of Science Graduate Fellowship (DOE SCGF) Program.

U.S. Department of Energy (2009).

Reviewed proposals for Early Career Awards.

Service to Professional Associations

Committee member, AGU's Board on Heads & Chairs of Earth and Space Science Departments, American Geophysical Union (2005–2010).

Service to Other Universities

External Examiner, *University of the West Indies, Cave Hill Campus (Barbados)* (2003–present).

Review final examinations in meteorology for UWI.

The Community

Committee Chair, Atmospheric System Research (ASR) Science and Infrastructure Steering Committee (SISC), U. Department of Energy (1995–present).

This committee provides scientific advice regarding the ASR program to the U.S. Department of Energy.

Member, Atmospheric Radiation Measurements (ARM) Program Climate Research Facility (ACRF) Science Board, U.S. Department of Energy (2004–2010).

The ACRF Science Board is an independent science review body appointed to make recommendations to the U.S. DOE on use of the ACRF for scientific research.