Brian Hannon Kahn

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Education

Ph.D, 2004   Atmospheric Sciences, University of California at Los Angeles (UCLA)
                      Department of Atmospheric and Oceanic Sciences
M.S., 2001   Atmospheric Sciences, UCLA
B.S., 1995   Meteorology (with honors), San Jose State University (SJSU)

Experience

2011–   Research Scientist, JPL
2009–2011   Scientist, JPL
2009–2019   Project Scientist, UCLA, Joint Institute for Regional Earth System Science and
                      Engineering (JIFRESSE)
2008   Assistant Researcher IV, UCLA/JIFRESSE
2005–2008   NASA Postdoctoral Program (NPP) Fellow
2003–2005   Academic Part-Time Researcher, JPL
2000–2004   Graduate Research Assistant, UCLA
1999–2002   Teaching Fellow, UCLA
1997–1999   Physics Lab Instructor, SJSU
1997–1999   Lecturer on Weather and Climate, SJSU
1996–1997   Exchange Student, Urals State University, Ekaterinburg, Russia
1994–1995   Summer Intern, National Weather Service Forecast Office, Anchorage, AK

Honors and Awards

NASA Postdoctoral Program (NPP) Fellowship Award (2005–2008)
NASA Earth Systems Science (ESS) Fellowship (2001–2004)
Brian Bosart Award, UCLA (2001)
Neiburger Teaching Award, UCLA (2000)
Scholarship to attend Urals State University, Ekaterinburg, Russia (1996–1997)

Professional Activities (current)

Co-Investigator, Polar Radiant Energy in the Far InfraRed Experiment (PREFIRE) (2018–)
Associate Editor, Atmospheric Measurement Techniques (2013–)
Member, CALIPSO/CloudSat Science Team (2008–)
Lead cloud scientist for the NASA/JPL Atmospheric Infrared Sounder (AIRS) project (2005–)
Member, American Geophysical Union (AGU) and American Meteorological Society (AMS)

Professional Activities (previous)

Reviewer/panelist for NASA, Department of Energy (DOE), National Oceanic and Atmospheric
Administration (NOAA), and Canadian Space Agency (CSA) proposals
Member, AMS Committee on Satellite Meteorology, Oceanography, and Climatology (2015–2017)
Member, Atmospheric Sciences Data Center (ASDC) User's Working Group (UWG) for the Distributed
Active Archive Center (DAAC) at the Langley Research Center (2010–2017)

Member, Moderate Resolution Imaging Spectroradiometer (MODIS) Science Team (2014–2017) and Atmospheric Infrared Sounder (AIRS) Science Team (2014–2017)

Refereed Publications (H = 22)

[79] L'Ecuyer, T. S., B. J. Drouin, B. H. Kahn, A. Merrelli, X. Huang, J. E. Kay, N.-J. Schlegel, S. Padmanabhan, B. Lim, C. Peterson, N. E. Miller, M. Mateling, D. Henderson, M. Grames, and J. Anheuser (2021), The Polar Radiant Energy in the Far-Infrared Experiment: A new perspective on Polar longwave energy exchanges, *Bull. Amer. Met. Soc.* doi:10.1175/BAMS-D-20-0155.1 (in press)

[78] Thompson, D. R., B. H. Kahn, P. G. Brodrick, M. D. Lebsock, M. Richardson, and R. O. Green (2021), Spectroscopic imaging of sub-kilometer spatial structure in lower-tropospheric water vapor, *Atmos. Meas. Tech.*, **14**, 2827–2840, https://doi.org/10.5194/amt-14-2827-2021

[77] Sandford, M. W., D. R. Thompson, R. O. Green, B. H. Kahn, R. Vitulli, S. Chien, A. Yelamanchili, and W. Olson-Duvall (2020), Global cloud property models for real-time triage on board visible-shortwave infrared spectrometers, *Atmos. Meas. Tech.*, **13**, 7047–7057, https://doi.org/10.5194/amt-13-7047-2020

[76] Kahn, B. H., B. J. Drouin, and T. S. L'Ecuyer (2020), Assessment of sampling sufficiency for low-cost satellite missions: Application to PREFIRE, *J. Atmos. Ocean. Tech.,* **37**, 2283–2298, doi: 10.1175/JTECH-D-20-0023.1.

[75] Saito, M., P. Yang, X. Huang, H. E. Brindley, M. G. Mlynczak, and B. H. Kahn (2020), Spaceborne middle- and far-infrared observations improving nighttime ice cloud property retrievals, *Geophys. Res. Lett.*, **47**, e2020GL087491. https://doi.org/ 10.1029/2020GL087491

[74] Liu, S., P. W. Staten, and B. H. Kahn (2020), Improved detection of interannual cloud variability over the Southern Hemisphere using legacy satellites, *J. Climate*, **33**, 8225–8236, doi:10.1175/JCLI-D-19-0758.1

[73] Peterson, C. A.., Q. Yue, B. H. Kahn, E. J. Fetzer, and X. Huang (2020), Evaluation of AIRS Cloud Phase Classification over the Arctic Ocean against Combined CloudSat-CALIPSO Observations, *J. Appl. Meteor. Climatol.*, **59**, 1277–1294, doi:10.1175/JAMC-D-20-0016.1

[72] Hulley, G. C., B. Dousset, and B. H. Kahn (2020), Rising trends in heatwave metrics across Southern California, *Earth's Future*, **8**, e2020EF001480, https://doi.org/10.1029/2020EF001480

[71] Esmaili, R. B., N. Smith, E. B. Berndt, J. F. Dostalek, B. H. Kahn, K. White, C. D. Barnet, W. Sjoberg, and M. Goldberg (2020), Adapting Satellite Soundings for Operational Forecasting within the Hazardous Weather Testbed, *Remote Sens.*, **12**, 886, doi:10.3390/rs12050886

[70] Guillaume, A., B. H. Kahn, E. J. Fetzer, Q. Yue, G. J. Manipon, B. D. Wilson, and H. Hua (2019), Footprint-scale cloud type mixtures and their impacts on Atmospheric Infrared Sounder cloud property retrievals, *Atmos. Meas. Tech.*, **12**, 4361–4377, https://doi.org/10.5194/amt-12-4361-2019.

[69] Kalmus, P., B. H. Kahn, S. W. Freeman, and S. C. van den Heever (2019), Trajectory-enhanced AIRS observations of environmental factors driving severe convective storms, *Mon. Wea. Rev.*, **147**, 1633–1653, doi:10.1175/MWR-D-18-0055.1.

[68] Yue, Q., B. H. Kahn, E. J. Fetzer, S. Wong, X. Huang, and M. Schreier (2019), Temporal and spatial characteristics of short-term cloud feedback on global and local interannual climate fluctuations from A-Train observations, *J. Climate*, **32**, 1875–1893, doi:10.1175/JCLI-D-18-0335.1

[67] Wang, C., S. Platnick, T. Fauchez, K. Meyer, Z. Zhang, H. Iwabuchi, and B. H. Kahn (2019), An assessment of the impacts of cloud vertical heterogeneity on global ice cloud data records from

passive satellite retrievals, *J. Geophys. Res. Atmos.*, **124**, 1578–1595, https://doi.org/10.1029/2018JD029681

[66] McCoy, D. T., P. R. Field., G. S. Elsaesser, A. Bodas-Salcedo, B. H. Kahn, M. D. Zelinka, C. Kodama, T. Mauritsen, B. Vanniere, M. Roberts, P. L. Vidale, D. Saint-Martin, A. Voldoire, R. Haarsma, A. Hill, B. Shipway, and J. Wilkinson (2019), Cloud feedbacks in extratropical cyclones: insight from long-term satellite data and high-resolution global simulations, *Atmos. Chem. Phys.*, **19**, 1147–1172, https://doi.org/10.5194/acp-19-1147-2019.

[65] Wong, S., C. M. Naud, B. H. Kahn, L. Wu, and E. J. Fetzer (2018), Coupling of precipitation and cloud structures in oceanic extratropical cyclones to large-scale moisture flux convergence, *J. Climate*, **31**, 9565–9684, doi:10.1175/JCLI-D-18-0115.1.

[64] Kahn, B. H., H. Takahashi, G. L. Stephens, Q. Yue, J. Delanoë, G. Manipon, E. M. Manning, and A. J. Heymsfield (2018), Ice cloud microphysical trends observed by the Atmospheric Infrared Sounder, *Atmos. Chem. Phys.*, **18**, 10715–10739, https://doi.org/10.5194/acp-18-10715-2018.

[63] Guillaume, A., B. H. Kahn, Q. Yue, E. J. Fetzer, S. Wong, G. J. Manipon, H. Hua, and B. D. Wilson (2018), Horizontal and vertical scaling of cloud geometry inferred from CloudSat data, *J. Atmos. Sci.*, **75**, 2187–2197, doi:10.1175/JAS-D-17-0111.1.

[62] Stephens, G. L., M. Z. Hakuba, M. Webb, M. Lebsock, Q. Yue, B. H. Kahn, S. Hristova-Veleva, A. Rapp, C. Stubenrauch, G. S. Elsasser, and J. Slingo (2018), Regional intensification of the tropical hydrological cycle during ENSO, *Geophys. Res. Lett.*, **45**, 4361–4370, https://doi.org/10.1029/2018GL077598.

[61] Dorrestijn, J., B. H. Kahn, J. Teixeira, and F. W. Irion (2018), Instantaneous variance scaling of AIRS thermodynamic profiles using a circular area Monte Carlo approach, *Atmos. Meas. Tech.*, **11**, 2717-2733, https://doi.org/10.5194/amt-11-2717-2018.

[60] Thompson, D. R., B. H. Kahn, R. O. Green, S. A. Chien, E. M. Middleton, and D. Q. Tran (2018), Global spectroscopic survey of cloud thermodynamic phase at high spatial resolution, 2005-2015, *Atmos. Meas. Tech.*, **11**, 1019–1030, https://doi.org/10.5194/amt-11-1019-2018.

[59] Irion, F. W., B. H. Kahn, M. M. Schreier, E. J. Fetzer, E. Fishbein, D. Fu, P. Kalmus, R. C. Wilson, S. Wong, and Q. Yue (2018), Single-footprint retrievals of temperature, water vapor, and cloud properties from AIRS, *Atmos. Meas. Tech.*, **11**, 971–995, https://doi.org/10.5194/amt-11-971-2018.

[58] Kahn, B. H., G. Matheou, Q. Yue, T. Fauchez, E. J. Fetzer, M. Lebsock, J. Martins, M. M. Schreier, K. Suzuki, and J. Teixeira (2017), An A-train and MERRA view of cloud, thermodynamic, and dynamic variability within the subtropical marine boundary layer, *Atmos. Chem. Phys.*, **17**, 9451–9468, https://doi.org/10.5194/acp-17-9451-2017.

[57] Chang, K.-W., T. S. L'Ecuyer, B. H. Kahn, and V. Natraj (2017), Information content of visible and midinfrared radiances for retrieving tropical ice cloud properties, *J. Geophys. Res. Atmos.*, **122**, 4944–4966, doi:10.1002/2016JD026357.

[56] Yue, Q., B. H. Kahn, E. J. Fetzer, S. Wong, R. Frey, and K. G. Meyer (2017), On the response of MODIS cloud coverage to global mean surface air temperature, *J. Geophys. Res. Atmos.*, **122**, 966–979, doi:10.1002/2016JD025174.

[55] Devasthale, A., J. Sedlar, B. H. Kahn, M. Tjernström, E. J. Fetzer, B. Tian, J. Teixeira, and T. S. Pagano (2016), A decade of spaceborne observations of the Arctic atmosphere: Novel insights from NASA's AIRS instrument, *Bull. Amer. Met. Soc.*, **97**, 2163–2176, doi:10.1175/BAMS-D-14-00202.1.

[54] Wang, T., E. J. Fetzer, S. Wong, B. H. Kahn, and Q. Yue (2016), Interpretation of MODIS cloud images using CloudSat/CALIPSO cloud vertical profiles, *J. Geophys. Res. Atmos.*, **121**, doi:10.1002/2016JD025239.

[53] Wong, S., A. D. Del Genio, T. Wang, B. H. Kahn, E. J. Fetzer, and T. S. L'Ecuyer (2016), Responses of tropical ocean clouds and precipitation to the large-scale circulation: Atmospheric water budget-related phase space and dynamical regimes, *J. Climate*, **29**, 7127–7143, doi:10.1175/JCLI-D-15-0712.1.

[52] Kahn, B. H., X. Huang, G. L. Stephens, W. D. Collins, D. R. Feldman, H. Su, S. Wong, and Q. Yue (2016), ENSO regulation of far- and mid-infrared contributions to clear-sky OLR, *Geophys. Res. Lett.*, **43**, 8751–8759, doi:10.1002/2016GL070263.

[51] Staten, P. W., B. H. Kahn, M. M. Schreier, and A. K. Heidinger (2016), Sub-pixel characterization of HIRS spectral radiances using cloud properties from AVHRR, *J. Atmos. Ocean Tech.*, **33**, 1519–1538, doi:10.1175/JTECH-D-15-0187.1.

[50] Stephens, G. L., B. H. Kahn, and M. Richardson (2016), The super greenhouse effect in a changing climate, *J. Climate*, **29**, 5469–5482, doi:10.1175/JCLI-D-15-0234.1.

[49] Sengupta, A., N. Cressie, B. H. Kahn, and R. Frey (2016), Predictive inference for big, spatial, non-Gaussian data: MODIS cloud data and its change-of-support, *Aust. N. Z. J. Stat.*, **58**(1), 15–45, doi:10.1111/anzs.12148.

[48] Yue, Q., B. H. Kahn, E. J. Fetzer, M. Schreier, S. Wong, X. Chen, and X. Huang (2016), Observation-based longwave cloud radiative kernels derived from the A-train, *J. Climate*, **29**, 2023–2040, doi:10.1175/JCLI-D-15-0257.1

[47] Anderson, D. C., J. M. Nicely, R. J. Salawitch, T. P. Canty, R. R. Dickerson, T. F. Hanisco, G. M. Wolfe, E. C. Apel, E. Atlas, T. Bannan, S. Bauguitte, N. J. Blake, J. F. Bresch, T. L. Campos, L. J. Carpenter, M. D. Cohen, M. Evans, R. P. Fernandez, B. H. Kahn, D. E. Kinnison, S. R. Hall, N. R. P. Harris, R. S. Hornbrook, J.-F. Lamarque, M. Le Breton, J. D. Lee, C. Percival, L. Pfister, R. B. Pierce, D. D. Riemer, A. Saiz-Lopez, B. J. B. Stunder, A. M. Thompson, K. Ullmann, A. Vaughan, and A. J. Weinheimer (2016), A pervasive role for biomass burning in tropical high ozone/low water structures, *Nat. Comm.*, **7**, doi:10.1038/ncomms10267.

[46] Wu, L., H. Su, R. G. Fovell, T. J. Dunkerton, Z. Wang, and B. H. Kahn (2015), Impact of environmental moisture on tropical cyclone intensification, *Atmos. Chem. Phys.*, **15**, 14031–14053.

[45] Kahn, B. H., M. M. Schreier, Q. Yue, E. J. Fetzer, F. W. Irion, S. Platnick, C. Wang, S. L. Nasiri, and T. S. L'Ecuyer (2015), Pixel-scale assessment and uncertainty analysis of AIRS and MODIS ice cloud optical thickness and effective radius, *J. Geophys. Res.*, **120**, doi:10.1002/2015JD023950.

[44] Naud, C. M., and B. H. Kahn (2015), Thermodynamic phase and ice cloud properties in northern hemisphere winter extratropical cyclones observed by Aqua AIRS, *J. Appl. Meteor. Climatol.*, **54**, 2283–2303, doi:10.1175/JAMC-D-15-0045.1.

[43] Lubin, D., B. H. Kahn, M. A. Lazzara, P. Rowe, and V. P. Walden (2015), Variability in AIRS-retrieved cloud amount and thermodynamic phase over west versus east Antarctica influenced by the SAM, *Geophys. Res. Lett.*, **42**, doi:10.1002/2014GL062285.

[42] Wong, S., E. J. Fetzer, M. Schreier, G. Manipon, E. F. Fishbein, B. H. Kahn, Q. Yue, and F. W. Irion (2015), Cloud-induced uncertainties in AIRS and ECMWF temperature and specific humidity, *J. Geophys. Res. Atmos.*, **120**, doi:10.1002/2014JD022440.

[41] Schreier, M. M., B. H. Kahn, K. Sušelj, J. Karlsson, S. C. Ou, Q. Yue, K.-F. Li, and S. L. Nasiri (2014), Atmospheric parameters in a subtropical cloud regime transition derived by AIRS and

MODIS: observed statistical variability compared to ERA-Interim, *Atmos. Chem. Phys.*, **14**, 3573–3587.

[40] Kahn, B. H., F. W. Irion, V. T. Dang, E. M. Manning, S. L. Nasiri, C. M. Naud, J. Blaisdell, M. M. Schreier, Q. Yue, K. W. Bowman, E. J. Fetzer, G. C. Hulley, K. N. Liou, D. Lubin, S. C. Ou, J. Susskind, Y. Takano, B. Tian, and J. Worden (2014), The Atmospheric Infrared Sounder Version 6 cloud products, *Atmos. Chem. Phys.*, **14**, 399–426.

[39] Yue, Q., E. J. Fetzer, B. H. Kahn, S. Wong, G. Manipon, A. Guillaume, and B. Wilson (2013), Cloud-state dependent sampling in AIRS observations based on CloudSat cloud classification, *J. Climate*, **26**, 8357–8377.

[38] Yue, Q., B. H. Kahn, H. Xiao, M. M. Schreier, E. J. Fetzer, J. Teixeira, and K. Suselj (2013), Transitions of cloud-topped marine boundary layers characterized by AIRS, MODIS, and a large eddy simulation model, *J. Geophys. Res. Atmos.*, **118**, 8598–8611, doi:10.1002/jgrd.50676.

[37] Ou, S.-C., B. H. Kahn, K. N. Liou, Y. Takano, M. M. Schreier, and Q. Yue (2013), Retrieval of cirrus cloud properties from the Atmospheric Infrared Sounder: The k-coefficient approach combined with SARTA plus delta-four stream approximation, *IEEE Trans. Geosci. Remote Sens.*, **51**, 1010–1024.

[36] Tian, B., E. J. Fetzer, B. H. Kahn, J. Teixeira, E. Manning, and T. Hearty (2013), Evaluating CMIP5 Models using AIRS Tropospheric Air Temperature and Specific Humidity Climatology, *J. Geophys. Res. Atmos.*, **118**, 114–134, doi:10.1029/2012JD018607.

[35] Devasthale, A., M. Tjenström, M. Caian, M. A. Thomas, B. H. Kahn, and E. J. Fetzer (2012), Influence of the Arctic Oscillation on the vertical distribution of clouds as observed by the A-train constellation of satellites, *Atmos. Chem. Phys.*, **12**, 10535–10544, doi:10.5194/acp-12-10535-2012.

[34] Wu, L., H. Su, R. G. Fovell, B. Wang, J. T. Shen, B. H. Kahn, S. M. Hristova-Veleva, B. H. Lambrigtsen, E. J. Fetzer, and J. H. Jiang (2012), Relationship of environmental relative humidity with North Atlantic tropical cyclone intensity and intensification rate, *Geophys. Res. Lett.*, **39**, L20809, doi:10.1029/2012GL053546.

[33] Braverman, A. J., E. J. Fetzer, B. H. Kahn, E. M. Manning, R. B. Oliphant, and J. P. Teixeira (2012), Massive data set analysis for NASA's Atmospheric Infrared Sounder, *Technometrics*, **54**, 1–15, doi:10.1080.00401706.2012.650504.

[32] Casey, S. P., E. J. Fetzer, and B. H. Kahn (2012), Revised identification of tropical oceanic cumulus congestus as viewed by CloudSat, *Atmos. Chem. Phys.*, **12**, 1587–1595.

[31] Wong, S., E. J. Fetzer, B. H. Kahn, B. Tian, B. Lambrigtsen, and H. Ye (2011), Closing the global water vapor budget with AIRS water vapor, MERRA reanalysis, TRMM and GPCP precipitation, and GSSTF surface evaporation, *J. Climate*, 24, 6307–6321.

[30] Kahn, B. H., S. L. Nasiri, M. M. Schreier, and B. A. Baum (2011), Impacts of sub-pixel cloud heterogeneity on infrared thermodynamic phase assessment, *J. Geophys. Res.*, **116**, D20201, doi:10.1029/2011JD015774.

[29] Yue, Q., B. H. Kahn, E. J. Fetzer, and J. Teixeira (2011), Relationship between oceanic boundary layer clouds and lower tropospheric stability observed by AIRS, CloudSat, and CALIOP, *J. Geophys. Res.*, **116**, D18212, doi:10.1029/2011JD016136.

[28] Kahn, B. H., J. Teixeira, E. J. Fetzer, A. Gettelman, S. M. Hristova-Veleva, X. Huang, A. K. Kochanski, M. Köhler, S. K. Krueger, R. Wood, and M. Zhao (2011), Temperature and water vapor variance scaling in global models: Comparisons to satellite and aircraft data, *J. Atmos. Sci.*, **68**, 2156–2168, doi:10.1175/2011JAS3737.1

[27] Nasiri, S. L., V. T. Dang, B. H. Kahn, E. J. Fetzer, E. M. Manning, M. M. Schreier, and R. A. Frey (2011), Comparing MODIS and AIRS infrared-based cloud retrievals, *J. Appl. Meteor. Clim.*, **50**, 1057–1072, doi:10.1175/2010JAMC2603.1.

[26] Martins, J. P. A., J. Teixeira, P. M. M. Soares, P. M. A. Miranda, B. H. Kahn, V. Dang, F. W. Irion, E. Fetzer and E. F. Fishbein (2010), Infrared sounding of the trade-wind boundary layer: AIRS and the RICO experiment, *Geophys. Res. Lett.* **37**, L24806, doi:10.1029/2010GL045902.

[25] Lee, S., B. H. Kahn, and J. Teixeira (2010), Characterization of liquid water content distributions from CloudSat, *J. Geophys. Res.*, **115**, D20203, doi:10.1029/2009JD013272.

[24] Schreier, M. M., B. H. Kahn, A. Eldering, D. A. Elliott, E. Fishbein, F. W. Irion, and T. S. Pagano (2010), Radiance comparisons of MODIS and AIRS using spatial response information, *J. Atmos. Ocean. Tech.*, **27**, 1331–1342, doi: 10.1175/2010JTECHA1424.1.

[23] Su, H., J. H. Jiang, J. D. Neelin, B. H. Kahn, J. W. Waters, N. J. Livesey, and Y. Gu (2010), Reply to comment by R. Rondanelli and R. S. Lindzen on ''Variations in convective precipitation fraction and stratiform area with sea surface temperature,'' *J. Geophys. Res.*, **115**, D06203, doi:10.1029/2009JD012872.

[22] Kahn, B. H., and J. Teixeira (2009), A global climatology of temperature and water vapor variance scaling from the Atmospheric Infrared Sounder, *J. Climate*, **22**, 5558–5576, doi: 10.1175/2009JCLI2934.1.

[21] Kahn, B. H., A. Gettelman, A. Eldering, E. J. Fetzer, and C. K. Liang (2009), Cloudy and clear sky relative humidity distributions in the upper troposphere observed by the A-train, doi:10.1029/2009JD011738, *J. Geophys. Res.*, **114**, D00H02, doi:10.1029/2009JD011738.

[20] Wu, D. L., S. A. Ackerman, R. Davies, D. J. Diner, M. J. Garay, B. H. Kahn, B. C. Maddux, C. M. Moroney, G. L. Stephens, J. P. Veefkind, and M. A. Vaughan (2009), Vertical distributions and relationships of cloud occurrence frequency as observed by MISR, AIRS, MODIS, OMI, CALIPSO, and CloudSat, *Geophys. Res. Lett.*, **36**, L09821, doi:10.1029/2009GL037464.

[19] Davis, S. M., L. M. Avallone, B. H. Kahn, K. G. Meyer, and D. Baumgardner (2009), Comparison of airborne in situ measurements and MODIS retrievals of cirrus cloud optical and microphysical properties during the Midlatitude Cirrus Experiment (MidCiX), *J. Geophys. Res.*, **114**, D02203, doi:10.1029/2008JD010284.

[18] Fetzer, E. J., W. G. Read, D. Waliser, B. H. Kahn, B. Tian, H. Vömel, F. W. Irion, H. Su, A. Eldering, M. de la Torre-Juarez, J. Jiang, and V. Dang (2008), Comparison of upper tropospheric water vapor observations from the Microwave Limb Sounder and Atmospheric Infrared Sounder, *J. Geophys. Res.*, **113**, D22110, doi:10.1029/2008JD010000.

[17] Nasiri, S. L., and B. H. Kahn (2008), Limitations of bispectral infrared cloud phase determination and potential for improvement, *J. Appl. Meteor. Climatol.*, **47**, 2895–2910.

[16] Kahn, B. H., and D. M. Sinton (2008), A preferred scale for warm core instability in a non-convective moist basic state, *J. Atmos. Sci.*, **65**, 2907–2921.

[15] Su, H., J. H. Jiang, Y. Gu, J. D. Neelin, B. H. Kahn, D. Feldman, Y. L. Yung, J. W. Waters, N. J. Livesey, M. L. Santee, and W. G. Read (2008), Variations of tropical upper tropospheric clouds with sea surface temperature and implications for radiative effects, *J. Geophys. Res.*, **113**, D10211, doi:10.1029/2007JD009624.

[14] Kahn, B. H., C. K. Liang, A. Eldering, A. Gettelman, Q. Yue, and K. N. Liou (2008), Tropical thin cirrus and relative humidity observed by the Atmospheric Infrared Sounder, *Atmos. Chem. Phys.*, **8**, 1501–1518.

[13] Kahn, B. H., M. T. Chahine, G. L. Stephens, G. G. Mace, R. Marchand, Z. Wang, C. D. Barnet, A. Eldering, R. E. Holz, R. E. Kuehn, and D. G. Vane (2008), Cloud-type comparisons of AIRS, CloudSat, and CALIPSO cloud height and amount, *Atmos. Chem. Phys.*, **8**, 1231–1248.

[12] Yue, Q., K. N. Liou, S. C. Ou, B. H. Kahn, P. Yang, and G. G. Mace (2007), Interpretation of AIRS data in thin cirrus atmospheres based on a fast radiative transfer model, *J. Atmos. Sci.* **64**, 3827–3842.

[11] Weisz, E., J. Li, W. P. Menzel, A. K. Heidinger, B. H. Kahn, and C.-Y. Liu (2007), Comparison of AIRS, MODIS, CloudSat and CALIPSO cloud top height retrievals, *Geophys. Res. Lett.*, **34**, L17811, doi:10.1029/2007GL030676.

[10] Kahn, B. H., E. Fishbein, S. L. Nasiri, A. Eldering, E. J. Fetzer, M. J. Garay, and S.-Y. Lee (2007), The radiative consistency of Atmospheric Infrared Sounder and Moderate Resolution Imaging Spectroradiometer cloud retrievals, *J. Geophys. Res.*, **112**, D09201, doi:10.1029/2006JD007486.

[9] Kahn, B. H., A. Eldering, A. J. Braverman, E. J. Fetzer, J. H. Jiang, E. Fishbein, and D. L. Wu (2007), Toward the characterization of upper tropospheric clouds using Atmospheric Infrared Sounder and Microwave Limb Sounder observations, *J. Geophys. Res.*, **112**, D05202, doi:10.1029/2006JD007336.

[8] Tinetti, G., V. S. Meadows, D. Crisp, N. Kiang, B. H. Kahn, E. Bosc, E. Fishbein, T. Velusamy, and M. Turnbull (2006), Detectability of planetary characteristics in disk-averaged spectra II: Synthetic spectra and light-curves of Earth, *Astrobiology*, **6**, 881–900.

[7] Kahn, B. H., K. N. Liou, S. -Y. Lee, E. F. Fishbein, S. DeSouza-Machado, A. Eldering, E. J. Fetzer, S. E. Hannon, and L. L. Strow (2005), Nighttime cirrus detection using Atmospheric Infrared Sounder channels and total column water vapor, *J. Geophys. Res.*, **110**, doi:10.1029/2004JD005430.

[6] Eldering, A., B. H. Kahn, F. P. Mills, F. W. Irion, H. M. Steele, and M. R. Gunson (2004), Vertical profiles of aerosol volume from high–spectral–resolution infrared transmission measurements II. Results, *J. Geophys. Res.*, **109**, D20201, doi:10.1029/2004JD004623.

[5] Braverman, A., and B. Kahn (2004), Visual data mining for quantized, spatial data. Invited paper, Proceedings in Computational Statistics, Physica-Verlag/Springer.

[4] Kahn, B. H., A. Eldering, M. Ghil, S. Bordoni, and S. A. Clough (2004), Sensitivity analysis of cirrus cloud properties from high-resolution infrared spectra. Part I: Methodology and synthetic cirrus, *J. Climate*, **17**, 4856–4870.

[3] Steele, H. M., A. Eldering, B. Sen, G. C. Toon, F. P. Mills, and B. H. Kahn (2003), Retrieval of Stratospheric Aerosol Size and Composition Information from Solar Infrared Transmission Spectra, *Appl. Opt.,* **42**, 2140–2154.

[2] Kahn, B. H., A. Eldering, S. A. Clough, E. J. Fetzer, E. F. Fishbein, M. R. Gunson, S. -Y. Lee, P. F. Lester, and V. J. Realmuto (2003), Near micron-sized cirrus cloud particles in high-resolution infrared spectra: An orographic case study, *Geophys. Res. Lett.*, **30**(8), 1441, doi:10.1029/2003GL016909.

[1] Kahn, B. H., A. Eldering, F. W. Irion, F. P. Mills, B. Sen, and M. R. Gunson (2002), Cloud identification in Atmospheric Trace Molecule Spectroscopy infrared occultation measurements, *Appl. Opt.*, **41**, 2368–2380.

Other Documents, Reports and Publications

[9] Yue, Q., B. Lambrigtsen, A. Behrangi, L. Chen, V. Dang, E. J. Fetzer, E. Fishbein, F. W. Irion, B. Kahn, E. Manning, P. Kalmus, E. Olsen, B. Tian, R. C. Wilson, and S. Wong, A., N. Cressie, R. Frey, and B. Kahn (2017), AIRS V6 Test Report Supplement: Performance of AIRS+AMSU vs.

AIRS-only retrievals: Analysis of the impact of the loss of AMSU-A2, 104 pp.

[8] Sengupta, A., N. Cressie, R. Frey, and B. Kahn (2013), Statistical modeling of MODIS cloud data using the spatial random effects model, Centre for Statistical and Survey Methodology, University of Wollongong, Working Paper 10-13, http://ro.uow.edu.au/cssmwp/118.

[7] Platnick, S., J. Gleason, P. Sellers, P. K. Bhartia, K. Bowman, J. Butler, B. Franz, D. Hall, C. Hsu, C. Justice, B. Kahn, E. Lobl, N. Loeb, T. Markus, C. McClain, R. McPeters, G. Meister, P. Minnett, T. Pagano, P. Pilewskie, L. Remer, M. Roman, D. Starr, J. Susskind, J. Teixeira, C. Tucker, J. Worden (2012), White paper on continuity of NASA satellite climate and Earth science data records into the NPP/JPSS-1 era, http://eospso.nasa.gov/sites/default/files/publications/ WhitePaper_NPP_JPSS_Continuity.pdf, 62 pp.

[6] Dang, V. T., B. Lambrigtsen, E. Manning, S. Wong, F. W. Irion, G. Hulley, J. Susskind, L. F. Iredell, J. M. Blaisdell, G. Molnar, B. H. Kahn, X. Xiong, J. Warner, B. Tian, L. Strow, and J. Teixeira (2012), AIRS/AMSU/HSB Version 6 Level 2 Performance and Test Report, https://disc.gsfc.nasa.gov/AIRS/documentation/v6_docs/V6_L2_Performance_and_Test_Report.pdf, 197 pp.

[5] Liang, C. K., A. Eldering, F. W. Irion, W. G. Read, E. J. Fetzer, B. H. Kahn, and K.-N. Liou (2010), Characterization of merged AIRS and MLS water vapor sensitivity through integration of averaging kernels and retrievals, Atmos. Meas. Tech. Discuss., 3, 2833–2859, www.atmos-meas-tech-discuss.net/3/2833/2010/doi:10.5194/amtd-3-2833-2010.

[4] Olsen, E. T., T. Hearty, S-Y Lee, F.W. Irion, B. Kahn, E. Manning, J. Blaisdell, J. Susskind, L. Iredell, C. Barnet, E. Maddy, P. Rosenkranz, W.W. McMillan, Sergio DeSouza-Machado, and R. Knuteson (2007), AIRS Version 5 release Level 2 standard product quickstart, https://disc.gsfc.nasa.gov/AIRS/documentation/v5_docs/V5_L1B_QA_Quick_Start.pdf, 67 pp.

[3] Hearty, T. J., E. T. Olsen, E. J. Fetzer, S.-Y. Lee, E. Fishbein, F.W. Irion, B. Kahn, E. Manning, S. Granger, and B. Tian (2007), AIRS/AMSU/HSB Version 5 Level 2 performance and test report, https://disc.gsfc.nasa.gov/AIRS/documentation/v5_docs/V5_Test_Report.pdf, 95 pp.

[2] Pagano, T. S., H. H Aumann, M. T. Chahine, E. Manning, S. Friedman, S. E. Broberg, S. J. Licata, D. A. Elliott, F. W. Irion, B. H. Kahn, E. Fishbein, E. Olsen, S. Granger, J. Susskind, F. Keita, J. Blaisdell, L. Strow, S. DeSouza-Machado, and C. Barnet (2006), Version 5 product improvements from the Atmospheric Infrared Sounder (AIRS), *Proc. SPIE* 6408, Remote Sensing of the Atmosphere and Clouds, 640808, doi:10.1117/12.696561.

[1] Kahn, B. H., W. Chan, and P. F. Lester (1998), An investigation of rotor flow using DFDR data, https://ntrs.nasa.gov/search.jsp?R=19970015304, 5 pp.

Invited Presentations and Lectures

[22] Kahn, B. H. (2019), *What can polar orbiting hyperspectral infrared sounders tell us about deep convection?*, Department of Atmospheric and Oceanic Sciences, University of Wisconsin–Madison, September 16, 2019, Madison, WI, USA.

[21] Kahn, B. H. (2019), *Adventures in cloud phase and ice microphysical retrievals from the A-train satellite constellation*, Gordon Research Conference on Radiation and Climate, July 21-26, 2019, Lewiston, ME, USA.

[20] Stephens, G. L., Kahn, B. H., and Marvel, K. D. (2019), *The Future is Cloudy: NASA's Look at Clouds and Climate*, von Karman Lecture Series, Jet Propulsion Laboratory and California Institute of Technology, April 18-19, 2019, Pasadena, CA, USA.

[19] Kahn, B. H. (2018), *Using hyperspectral infrared sounders to link cloud microphysics, thermodynamics, and the atmospheric circulation*, Department of Atmospheric Sciences seminar series, University of Utah, February 2018, Salt Lake City, UT, USA.

[18] Kahn, B. H. (2017), *On the characterization of ice clouds from hyper-spectral infrared satellite observations*, JPL Center for Climate Sciences, March 2017, Pasadena, CA, USA.

[17] Kahn, B. H. (2016), *On the characterization of ice clouds from hyper-spectral infrared satellite observations*, International Radiation Symposium, April 2016, Auckland, New Zealand.

[16] Kahn, B. H. (2015), *Subtropical humidity and cloud organization across thermodynamic and dynamic states using NASA Aqua and MERRA observations*, Department of Physics, University of Maryland– Baltimore County, October 2015, Baltimore, MD, USA.

[15] Kahn, B. H. (2015), *Subtropical humidity and cloud organization by thermodynamic and dynamic states using A-train and reanalysis data*, International Union on Geodesy and Geophysics, June 2015, Prague, Czech Republic.

[14] Kahn, B. H. (2014), *A survey of tropospheric cloud observations from the Atmospheric Infrared Sounder*, Caltech Yuk Yung Lunch Seminar, June 2014, Pasadena, CA, USA.

[13] Kahn, B. H. (2011), *Practical examples of AIRS, MODIS, and CloudSat-centric synergy of temperature, water vapor, and clouds*, ESA-NASA Workshop on A-train Constellation Management, May 2011, Montreal, Quebec, Canada.

[12] Kahn, B. H. (2011), *A few ideas on using A-train observations of temperature, water vapor, and clouds to evaluate and "improve" the realism of climate models*, Department of Atmospheric Sciences seminar series, University of Utah, March 2011, Salt Lake City, UT, USA.

[11] Kahn, B. H. and Coauthors (2010), *Temperature and water vapor variance scaling from the Atmospheric Infrared Sounder, climate models, and aircraft data*, December 2010, Fall Meeting, American Geophysical Union, San Francisco, CA, USA.

[10] Kahn, B. H. (2009), *A-train studies of temperature and water vapor variance scaling and upper tropospheric relative humidity distributions*, Department of Atmospheric Science seminar series, April 2009, Colorado State University, Fort Collins, CO, USA.

[9]   Kahn, B. H. (2008), *An observational view of clouds, temperature, humidity, and small-scale variability from the A-train*, Yuk Yung lunch seminar, California Institute of Technology, Pasadena, CA, USA.

[8]   Kahn, B. H. (2008), *Relationships between clouds, temperature, and humidity: A perspective from AIRS, CloudSat, and CALIPSO*, AeroCenter at the Goddard Space Flight Center, Greenbelt, MD, USA.

[7]   Kahn, B. H. (2008), *Ice cloud and humidity distributions viewed by the A-train*, Department of Atmospheric and Oceanic Sciences, University of Colorado, Boulder, CO, USA.

[6]   Kahn, B. H. (2007), *The retrieval of cirrus quantities from AIRS observations: Some challenges and opportunities*, Hyperspectral Imaging and Sounding of the Environment topical meeting, Optical Society of America, Santa Fe, NM, USA.

[5]   Kahn, B. H., M. T. Chahine, G. G. Mace, R. Marchand, and G. L. Stephens (2006), *A combined view of CloudSat and AIRS cloud fields*, December 2006, Fall Meeting, American Geophysical Union, San Francisco, CA, USA.

[4]   Kahn, B. H. (2006), *An AIRS-centric view of global cloudiness from the A-train*, Department of Atmospheric Sciences, Texas A&M University, College Station, TX, USA.

[3] Kahn, B. H. (2005), *Towards characterizing cirrus clouds with the Atmospheric Infrared Sounder*, Yuk Yung lunch seminar, California Institute of Technology, Pasadena, CA, USA.

[2] Kahn, B. H. (2005), *On the detection and retrieval of cirrus cloud properties using AIRS data*, Department of Meteorology, Penn State University, State College, PA, USA.

[1] Kahn, B. H. (2004), *On cirrus (and aerosol) properties from high-resolution infrared spectra*, Yuk Yung lunch seminar, California Institute of Technology, Pasadena, CA, USA.