

# SUDERSHAN GANGRADE

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## EDUCATION

- Aug 2016 – Dec 2019      Ph.D., Energy Science and Engineering  
**University of Tennessee, Knoxville, TN**  
Focus Area: Environmental and Climate Sciences  
*Dissertation Topic: Assessing Hydrologic Vulnerability and Resilience of Critical Energy-Water Infrastructures in a Changing Environment*
- Aug 2010 – Aug 2012      M.S., Environmental Engineering and Science  
**Clemson University, Clemson, SC**  
*Dissertation Topic: Evaluation of use of EM38-MK2 as a Tool to Understand Field Scale Changes in Soil Properties*
- Aug 2006 – May 2010      B.Tech., Environmental Engineering  
**Indian School of Mines, Dhanbad, India**

## PROFESSIONAL APPOINTMENTS

- Dec 2019 – Present      Research & Development Staff (Water Resources Engineer)  
Renewable Energy Systems Group,  
Environmental Sciences Division  
**Oak Ridge National Laboratory, Oak Ridge, TN**  
*Research Area: Large Scale Hydrologic and Land Surface Modeling, Hydrodynamic Flood Simulations, Hydroclimate Impact Assessment, Water Resources Management, Extreme Flood Events*
- Aug 2016 – Dec 2019      Bredesen Center Fellow  
**University of Tennessee, Knoxville, TN and  
Oak Ridge National Laboratory, Oak Ridge, TN**
- Jun 2019 – Aug 2019      Visiting Researcher, Research Applications Laboratory  
**National Center for Atmospheric Research, Boulder, CO**
- Mar 2014 – Jun 2016      Post Masters Research Associate, Environmental Sciences Division  
**Oak Ridge National Laboratory, Oak Ridge, TN**
- Jan 2013 – Mar 2014      Staff Environmental Engineer/Geophysicist  
Oct 2012 – Dec 2012      Engineering Intern  
**Mundell & Associates, Inc., Indianapolis, IN**
- Aug 2010 – Aug 2012      Graduate Research Assistant  
Department of Environmental Engineering and Earth Sciences  
**Clemson University, Clemson, SC**
- Jun 2010 – Jul 2010 &  
May 2009 – Jun 2009      Summer Intern  
Society of Exploration Geophysicists-Geoscientists Without Borders  
**Clemson University, Clemson, SC**

## RESEARCH PROJECTS

Jul 2018 – Present	Air Force/ Oak Ridge National Laboratory R&D Collaboration. Sponsor: U.S. Air Force. <i>Role: Research Associate</i> (Principal Investigator: K.J. Evans, ORNL)
Oct 2017 – Present	Effects of Climate Change on Federal Hydropower – The Third 9505 Assessment. Sponsor: Water Power Technologies Office, U.S. Department of Energy. <i>Role: Research Associate</i> (Principal Investigator: S.-C. Kao, ORNL)
Jun 2017 – May 2018	Development of Ensemble based Probabilistic Flood Maps for Probable Maximum Flood. Sponsor: Hydro Research Foundation Research Awards. <i>Role: Principal Investigator (under supervision of S.-C. Kao, ORNL)</i>
Aug 2015 – Mar 2016	Review of Site-Specific Probable Maximum Precipitation Analyses. Sponsor: Office of New Reactors, U.S. Nuclear Regulatory Commission. <i>Role: Research Associate</i> (Principal Investigator: S.-C. Kao, ORNL)
Mar 2014 – Mar 2017	Effects of Climate Change on Federal Hydropower – The Second 9505 Assessment. Sponsor: Water Power Technologies Office, U.S. Department of Energy. <i>Role: Research Associate</i> (Principal Investigator: S.-C. Kao, ORNL)
Mar 2014 – Sep 2015	Towards the Development of an Integrated Energy-Water Risk Assessment Tool for Probable Maximum Precipitation and Flood. Sponsor: Laboratory Directed Research and Development Program, Oak Ridge National Laboratory. <i>Role: Research Associate</i> (Principal Investigator: S.-C. Kao, ORNL)
Jun 2010 – Aug 2012	Addressing the Water Crisis in Rural India using Electromagnetic Induction. Sponsor: SEG Geoscientists Without Borders. <i>Role: Research Associate</i> (Principal Investigator: Stephen Moysey, Clemson University)

## RESEARCH INTERESTS

Large scale hydrological modeling, flood modeling, hydroclimate extremes, impacts of changing environment on water resources and reservoir operations

## TECHNICAL SKILLS

- Distributed Hydrologic Modeling - DHSVM, PRMS, VIC, SUMMA, LIS
- Flood Modeling – Flood2D-GPU, FLO-2D
- Programming and Scripting - MATLAB, Python, C, Shell, Stata
- Geographic Information System – ArcGIS, QGIS, GDAL

## PUBLICATIONS

### Peer Reviewed [6]

1. **Gangrade, S., Kao, S. C., Dullo, T. T., Kalyanapu, A. J., & Preston, B. L.** (2019). Ensemble-based Flood Vulnerability Assessment for Probable Maximum Flood in a Changing Environment. *Journal of Hydrology*, 576, 342-355, doi: 10.1016/j.jhydrol.2019.06.027.

2. **Gangrade, S.**, S.-C. Kao, B.S. Naz., D. Rastogi, M. Ashfaq, N. Singh, and B.L. Preston (2018), Sensitivity of probable maximum flood in a changing environment, *Water Resources Research*, 54(6), 3913-3936, doi:10.1029/2017WR021987.
3. Jager, H. I., A.W. King, **S. Gangrade**, A. Haines, C. DeRolph, B.S. Naz, and M. Ashfaq (2018), Will future climate change increase the risk of violating minimum flow and maximum temperature thresholds below dams in the Pacific Northwest?, *Climate Risk Management*, 21, 69-84, doi:10.1016/j.crm.2018.07.001.
4. Naz, B. S., S.-C. Kao, M. Ashfaq., H. Gao, D. Rastogi, and **S. Gangrade** (2018), Effects of climate change on streamflow extremes and implications for reservoir inflow in the United States, *Journal of Hydrology*, 556, 359-370, doi: 10.1016/j.jhydrol.2017.11.027.
5. Rastogi, D., S.-C. Kao, M. Ashfaq, R. Mei, E.D. Kabela, **S. Gangrade**, ... and V.G. Anantharaj, (2017), Effects of climate change on probable maximum precipitation: A sensitivity study over the Alabama-Coosa-Tallapoosa River Basin, *Journal of Geophysical Research: Atmospheres*, 122(9), 4808-4828, doi: /10.1002/2016JD026001.
6. Ashfaq, M., D. Rastogi, R. Mei, S.-C. Kao, **S. Gangrade**, B.S. Naz, and D. Touma (2016), High-resolution ensemble projections of near-term regional climate over the continental United States, *Journal of Geophysical Research: Atmospheres*, 121(17), 9943-9963, doi:10.1002/2016JD025285.

#### **Selected Presentations [20]**

1. **Gangrade, S.**, S.-C. Kao, R. McManamay (2019), Multi-model, Multi-resolution Hydroclimate Projections and Associated Uncertainties: A Case Study for the Alabama-Coosa-Tallapoosa River Basin in the Southeastern United States. American Geophysical Union 2019 Fall Meeting, Dec. 9–13, Washington, D.C..
2. Holmes, C., **S. Gangrade**, G. Zhao, K. Lander, N. Voisin, S.-C. Kao, M. Shao, and H. Gao (2019), Evaluating the Effects of Forecast Lead Time on Streamflow and Inundation Predictions in Brays Bayou, Houston, Texas through Coupled Hydrologic-Hydraulics Models, American Geophysical Union 2019 Fall Meeting, Dec. 9–13, Washington, D.C..
3. Siddique, R., A. Wood, N. Mizukami, **S. Gangrade**, H. Liu, B. Nijssen, A.J. Newman, K. FitzGerald, A.L. Dugger, M. Barlage, and D. Gochis (2019), Development of watershed-based large-domain modeling to support monitoring, prediction and water management applications, American Geophysical Union 2019 Fall Meeting, Dec. 9–13, Washington, D.C..
4. **Gangrade S.**, M. Shao, S.-C. Kao, G. Zhao, and H. Gao (2019), Robustness of reservoir operations in a changing environment – A case study for Allatoona Dam in Alabama-Coosa-Tallapoosa (ACT) River Basin, World Environmental & Water Resources Congress 2019, May 19 – 23, Pittsburgh, PA.
5. **Gangrade, S.**, S.-C. Kao, T. T. Dullo, and A. J. Kalyanapu (2018), Ensemble-based Probabilistic Flood Maps for Probable Maximum Flood, American Geophysical Union 2018 Fall Meeting, Dec. 10–14, Washington, D.C..
6. Dullo, T. T., **S. Gangrade**, A. J. Kalyanapu, S.-C. Kao, S. Ghafoor, and K. J. Evans (2018), High-resolution modeling of Hurricane Harvey Flooding for Harris County, TX using a calibrated GPU-accelerated 2D Flood Model, American Geophysical Union 2018 Fall Meeting, Dec. 10–14, Washington, D.C.
7. **Gangrade, S.**, S.-C. Kao, B. S. Naz, D. Rastogi, M. Ashfaq, N. Singh, and B. L. Preston (2018), Evaluating the Sensitivity of Probable Maximum Flood using a High-resolution Distributed Hydrologic Model, World Environmental & Water Resources Congress 2018, June 3-7, Minneapolis, MN.
8. Dullo, T. T., **S. Gangrade**, R. Marshall, S. R. Islam, S. Ghafoor, S.-C. Kao, and A. J. Kalyanapu (2017), The Vulnerability of Critical Infrastructures to Climate Change Induced Flooding: A Case Study for

the Conasauga River Basin, 27th Tennessee Watershed Symposium: Adapting to Hydrologic Extremes, April 11-13, Montgomery Bell State Park, Burns, TN.

9. Dullo, T. T., **S. Gangrade**, R. Marshall, S. R. Islam, S. Ghafoor, S.-C. Kao, and A. J. Kalyanapu (2017), A Large-scale Simulation of Climate Change Effects on Flood Regime - A Case Study for the Alabama-Coosa-Tallapoosa River Basin, American Geophysical Union 2017 Fall Meeting, Dec. 11-15, New Orleans, LA.
10. **Gangrade, S.**, S.-C. Kao, D. Rastogi, M. Ashfaq, B. S. Naz, E. D. Kabela, V. Anantharaj, N. Singh, B. L. Preston, and R. Mei (2016), Evaluation of Probable Maximum Precipitation and Flood under Climate Change in the 21st Century, American Geophysical Union 2016 Fall Meeting, Dec. 12-16, San Francisco, CA.
11. Kao, S.-C., B. S. Naz, **S. Gangrade**, M. Ashfaq, and D. Rastogi (2016), Sensitivity of Hydrologic Extremes to Spatial Resolution of Meteorological Forcings: A Case Study of the Conterminous United States, American Geophysical Union 2016 Fall Meeting, Dec. 12-16, San Francisco, CA.
12. **Gangrade, S.**, S.-C. Kao, B. S. Naz, M. Ashfaq, and D. Rastogi (2016), Evaluating the Uncertainties of Future Water Availability Projections through the Choice of Different Hydrologic Models, World Environmental & Water Resources Congress 2016, May 22-26, West Palm Beach, FL.
13. Naz, B. S., S.-C. Kao, M. Ashfaq, D. Rastogi, R. Mei, and **S. Gangrade** (2016), Assessing Hydrological Impacts of Climate Change in the United States: Implication for Hydropower Facilities, World Environmental & Water Resources Congress 2016, May 22-26, West Palm Beach, FL.
14. **Gangrade, S.**, B. S. Naz, S.-C. Kao, M. Ashfaq, R. Mei, D. Rastogi, B. L. Preston, E. D. Kabela, N. Singh, and V. Anantharaj (2015), High Resolution Distributed Hydrological Modeling for Extreme Flood Events, World Environmental & Water Resources Congress 2015, May 17 - 21, Austin, TX.
15. S.-C. Kao, B. S. Naz and **S. Gangrade** (2015), Sensitivity of Regional Hydropower Generation to the Projected Changes in Future Watershed Hydrology, American Geophysical Union 2015 Fall Meeting, Dec. 14-18, San Francisco, CA.
16. Ashfaq, M., D. Rastogi, R. Mei, S.-C. Kao, B. S. Naz, and **S. Gangrade** (2015), Near-term Intensification of the Hydrological Cycle in the United State, American Geophysical Union 2015 Fall Meeting, Dec. 14-18, San Francisco, CA.
17. Kao, S.-C., B. S. Naz, **S. Gangrade**, M. Ashfaq, R. Mei, and D. Rastogi (2014), Projection of Climate Change Impacts on Watershed Storage and Hydropower Generation, American Geophysical Union 2014 Fall Meeting, Dec. 14-19, San Francisco, CA.
18. Naz, B. S., S.-C. Kao, M. Ashfaq, **S. Gangrade**, R. Mei, and D. Rastogi (2014), Climate Change Impacts on Reservoir Inflow in the United States, American Geophysical Union 2014 Fall Meeting, Dec. 14-19, San Francisco, CA.
19. Ashfaq, M., D. Rastogi, R. Mei, S.-C. Kao, B. S. Naz, and **S. Gangrade** (2014), Ultra High-resolution Ensemble Projections of the Near-term Climate Change over the U.S., American Geophysical Union 2014 Fall Meeting, Dec. 14-19, San Francisco, CA.
20. **Gangrade, S** and S. Moysey (2011), Evaluation of EM38 as a Tool for Improving Irrigation Practices in Rural India, 24rd EEGS Symposium on the Application of Geophysics to Engineering and Environmental Problems, Charleston SC.

## HONORS AND AWARDS

- Bredesen Center Fellow, Aug 2016 - Dec 2019
- Hydro Research Foundation (HRF) Research Fellow, Jun 2017 - May 2018
- Featured in 'The Leading Edge' Magazine (Link : [2013 issue](#)), Nov 2013
- Invited as the only international student representative in *Society of Exploration Geophysicists - Geoscientist Without Borders* Project Board Meeting, Tulsa, Oklahoma, Aug 2012.
- Graduate Research/Teaching Assistantship, Clemson University, Clemson, SC, 2010-2012.

## PROFESSIONAL CERTIFICATIONS/ TRAININGS

- Engineer In Training (E.I.T) - NCEES Fundamentals of Engineering Examinations
- Diversity & Inclusion Workshop, 2019, National Center for Atmospheric Research, Boulder, CO

## PROFESSIONAL SERVICE AND LEADERSHIP ROLES

- Session Chair, “Continental-Scale Modeling: Process Heterogeneity from Summit to Sea IV Posters”, American Geophysical Union 2019 Fall Meeting, Dec. 9–13, Washington, D.C., 2019.
- Primary Convener and Session Chair, “Recent Advances in Large-Scale, High-Resolution Hydrologic and Flood Modeling for Intensified Extreme Events in a Changing Environment”, American Geophysical Union 2018 Fall Meeting, Dec. 10–14, Washington, D.C., 2018
- Member, Hydroclimate Technical Committee, ASCE/EWRI, 2015-2016, 2018, 2019
- Member, Oak Ridge Post-Doctoral Association Executive Committee, 2015-2016
- Student Poster Judge, American Geophysical Union Fall Meeting, 2015.
- Journal Reviewer, *Journal of Hydrologic Engineering*, *Climate and Development*, *Journal of the American Water Resources Association*, *Water*, *Hydrology*
- Member, Student Advisory Committee, Environmental Engineering and Earth Sciences, Clemson University.