**Chengsi Liu**

**Center for Analysis and Prediction of Storms** **(405) 325-5582**

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**Education**

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| B.A. | Atmosphere Science | Nanjing University of Informational Science and Technology | 2002 |
| M.S. | Atmosphere Science | Chinese Academic of Meteorological Sciences | 2005 |
| Ph.D. | Geophysical fluid dynamics | Institute of Atmospheric Physics | 2008 |

**Professional Experience**

**2012 – present** **Center for Analysis and Prediction of Storms (CAPS), University of Oklahoma**

*Senior Research Scientist, Data assimilation team lead(2019-present),* responsible for development of data assimilation method and application for convective-scale weather. Principal Developer of APRS hybrid ensemble 3D/4D variational data assimilation system, and CAPS radar data assimilation capabilities within GSI-based and JEDI-based hybrid ensemble variational framework

**2010 – 2012 Marine Science College, University of South Florida**

*Scientific researcher,* developing an ensemble-based four-dimensional variational data assimilation scheme for Antarctic applications with advanced research WRF using real data

**2008 – 2010 National Meteorological Center, China Meteorological Administration**

*Meteorologist*, working for GPS total precipitation water data assimilation

**2007 – 2008 Mesoscale and Microscale Meteorology Division, National Center for Atmospheric Research (NCAR)**

*Visiting scholar*, developing an Ensemble-based four-dimensional variational data assimilation scheme

**Appointments**

2018 – present Senior Research scientist, Center for Analysis and Prediction of Storms (CAPS), Universality of Oklahoma (OU).

2012 – 2018 Research scientist, CAPS, OU.

2010 – 2012 Scientific researcher, Marine Science College, University of South Florida.

2008 – 2010 Meteorologist, National Meteorological Center/China Meteorological Administration, Beijing, R.P. China.

2007 – 2008 Visiting scholar, Mesoscale and Microscale Meteorology Division/National Center for Atmospheric Research (NCAR), United States.

#### Representative publications on data assimilation

1. Kong, R., M. Xue, E. R. Mansell, C. Liu, and A. O. Fierro, 2024: Assimilation of GOES-R Geostationary Lightning Mapper Flash Extent Density Data in GSI 3DVar, EnKF, and Hybrid En3DVar for the Analysis and Short-Term Forecast of a Supercell Storm Case. Adv. Atmos. Sci., 41, 263-277.
2. Park, J., M. Xue, and C. Liu, 2023: Implementation and Testing of Radar Data Assimilation Capabilities within the Joint Effort for Data assimilation Integration (JEDI) Framework with Ensemble Transformation Kalman Filter coupled with FV3-LAM Model. Geophy. Res. Lett., 50, e2022GL102709, <https://doi.org/10.1029/2022GL102709>.
3. Liu, C., H. Li, M. Xue, Y. Jung, J. Park, L. Chen, R. Kong, and C.-C. Tong, 2022: Use of a Reflectivity Operator Based on Two-Moment Thompson Microphysics for Direct Assimilation of Radar Reflectivity in GSI-based Hybrid En3DVar. Mon. Wea. Rev., 150, 907-926. https://doi.org/10.1175/MWR-D-21-0040.1
4. Kong, R., M. Xue, C. Liu, A. O. Fierro, and E. R. Manselld, 2022: Development of new observation operators for assimilating GOES-R geostationary lightning mapper flash extent density data using GSI EnKF: Tests with two convective events over the US. Mon. Wea. Rev., https://doi.org/10.1175/MWR-D-21-0326.1.
5. [Li, H., C. Liu, M. Xue, J. Park, L. Chen, Y. Jung, R. Kong, and C.-C. Tong](https://twister.caps.ou.edu/papers/LiEtal_MWR2022.pdf) , 2022: Use of power transform total number concentration as control variable for direct assimilation of radar reflectivity in GSI En3DVar and tests with six convective storms cases. Mon. Wea. Rev., 150, 821-842. <https://doi.org/10.1175/MWR-D-21-0041.1>
6. Chen, L., C. Liu, Y. Jung, P. Skinner, M. Xue, and R. Kong, 2022: Object-based Verification of GSI-based EnKF and Hybrid En3DVar Radar Data Assimilation and Convection-Allowing Forecasts within a Warn-on-Forecast Framework. Wea. Forecasting, 37, 639-658.<https://doi.org/10.1175/WAF-D-20-0180.1>
7. Chen, L., C. Liu, M. Xue, G. Zhao, R. Kong, and Y. Jung, 2021: Use of Power Transform Mixing Ratios as Hydrometeor Control Variables for Direct Assimilation of Radar Reflectivity in GSI-based En3DVar and Tests with Five Convective Storms Cases. Mon. Wea. Rev., 149, 645-659. <https://doi.org/10.1175/MWR-D-20-0149.1>
8. [Labriola, J., Y. Jung, C. Liu and M. Xue](http://twister.ou.edu/papers/Labriola_et_al_WAF2020.pdf), 2021: Evaluating forecast performance and sensitivity to the GSI EnKF data assimilation configuration for the 28-29 May 2017 mesoscale convective system case. Wea. Forecasting, 36, 127-146. <https://doi.org/10.1175/WAF-D-20-0071.1>.
9. Kong, R., M. Xue, C. Liu, and Y. Jung, 2021: Comparisons of Hybrid En3DVar with 3DVar, and EnKF for Radar Data Assimilation: Tests with the 10 May 2010 Oklahoma Tornado outbreak. Mon. Wea. Rev., https://doi.org/10.1175/MWR-D-20-0053.1
10. Liu, C., M. Xue, and R. Kong, 2020: Direct variational assimilation of radar reflectivity and radial velocity data: Issues with nonlinear reflectivity operator and solutions. Mon. Wea Rev., DOI: 10.1175/MWR-D-19-0149.1
11. Kong, R., M. Xue, A. O. Fierro, Y. Jung, C. Liu, E. R. Mansell, and D. R. MacGorman , 2020: Assimilation of GOES-16 Geostationary Lightning Mapper Flash Extent Density Data in GSI EnKF for the Analysis and Short Term Forecast of a Mesoscale Convective System. Mon. Wea. Rev., DOI: 10.1175/MWR-D-19-0192.1
12. Tong, C.-C., Y. Jung, M. Xue, and C. Liu, 2020: Direct assimilation of radar data within the National Weather Service operational GSI EnKF and hybrid En3DVar systems for the stand-alone regional FV3 model at a convection-allowing resolution. Geophy. Res. Lett., https://doi-org/10.1029/2020GL090179.
13. [Liu, C., M. Xue, and R. Kong](https://twister.caps.ou.edu/papers/Liu_Kong_XueMWR2019.pdf), 2019: Direct assimilation of radar reflectivity data using 3DVAR: Treatment of hydrometeor background errors and OSSE tests. Mon. Wea. Rev., 137, 17-29.
14. Kong, R., M. Xue, and C. Liu, 2018: Development of a hybrid en3DVar data assimilation system and comparisons with 3DVar and EnKF for radar data assimilation with observing system simulation experiments. Mon. Wea. Rev., 146, 175–198.
15. Liu, C., and M. Xue, 2016: Relationships among four-dimensional hybrid ensemble-variational data assimilation algorithms with full and approximate ensemble covariance localization. Mon. Wea. Rev., 144, 591-606.
16. Liu, C., and Q. Xiao, 2013: An ensemble-based four-dimensional variational data assimilation scheme. Part III: Antarctic applications with advanced research WRF using real data. Mon. Wea. Rev., 141, 2721–2739.
17. Chu K., Q. Xiao and C. Liu, 2013: Experiments of the WRF three-/four-dimensional variational (3/4DVAR) data assimilation in the forecasting of Antarctic cyclones. Meteorology and Atmospheric Physics 120 (3-4), 145-156
18. Liu, C., Q. Xiao, and B. Wang, 2009: An Ensemble-Based Four-Dimensional Variational Data Assimilation Scheme. Part II: Observing System Simulation Experiments with Advanced Research WRF (ARW). Mon. Wea. Rev., 137, 1687–1704.
19. Liu, C., Q. Xiao, and B. Wang, 2008: An Ensemble-Based Four-Dimensional Variational Data Assimilation Scheme. Part I: Technical Formulation and Preliminary Test. Mon. Wea. Rev., 136, 3363–3373.
20. Wang Bin, Liu Juanjuan, Wang Shudong, Cheng Wei, Liu Juan, Liu Chengsi, Qingnong Xiao and Ying-Hwa Kuo. 2010, An Economical Approach to Four-dimensional Variational Data Assimilation. Advances in Atmospheric Sciences, 27, 715-727.
21. Liu, C., and J. Xue．2005: The Development of the Theory and Method of the EnKF. vol(6), JOURNAL OF TROPICAL METEOROLOGY, China.

**Synergistic activities**

1. Team lead of CAPS’s data assimilation group
2. Principal Developer of APRS hybrid ensemble 3D/4D variational data assimilation system
3. Principal Developer of CAPS radar data assimilation capabilities within GSI-based and JEDI-based hybrid ensemble variational framework
4. PI of a NOAA JTTI, and Co-PI of NOAA grants of HWT, WoF, JTTI related to DA.
5. Peer Reviewer for the following journals: Monthly Weather Review, Advances in Atmospheric Sciences, Tellus, Quarterly Journal of the Royal Meteorological Society