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NEWS IN THIS QUARTER

GNSSRO Partnership Makes Big Strides

Hailing Zhang (JCSDA)

One absolutely key aspect of all observation processing is the Quality Control (QC). JCSDA's Dr. Hailing Zhang recently visited the UK Met Office, supported by the Visiting Scientist Program (VSP) of the Radio Occultation Meteorology Satellite Application Facility (ROM SAF), to explore the relative benefits of different QC methods for GNSS Radio Occultation (RO) observations in Numerical Weather Prediction (NWP). Working with Neill Bowler, she started with a comprehensive survey of RO QC methods employed by major NWP centers worldwide. Although these centers share many common processes, there are also substantial differences between individual centers' methods. The QC methods surveyed included observation sanity check (or preliminary QC), super refraction check, and background departure QC.

The second step in their research was to implement these methods into a set of filters that are independent of operators and adaptable across various models and operators. The overarching aim is to provide feedback to NWP centers by inter-comparing the effectiveness of each QC method.

The collaborative effort proved highly productive, marked by the successful merging of several pull requests (PRs) in the JEDI repositories of UFO and IODA-converters. These added PRs updated the ioda-converter in order to produce generic IODA files, and added new test files which represent diverse scenarios so it can be used not only for this study but also for many other GNSSRO tests. Most importantly, multiple UFO filters were added as proposed. Dr. Zhang and Dr. Bowler's ongoing work is to inter-compare these independent filters.

Hailing is in the process of planning a second visit to finalize her research and compile the comprehensive final report, scheduled for completion in April 2024.

Dr. Hailing Zhang with Dr. Neill Bowler during her visit to the UK

VADER Implementation Expands

Steve Vahl (JCSDA)

VADER (VAriable DErivation Repository) is one of the newest JEDI generic repositories, with its first implementation appearing in April 2022. Containing generic variable change code, its usage and capabilities have slowly but steadily grown since that introduction. FV3-JEDI was the first model interface repository to use VADER's classes to perform variable changes, and since then it has also been added to SABER, SOCA, and Met Office model repositories. The number of variable changes it is capable of performing has also grown.

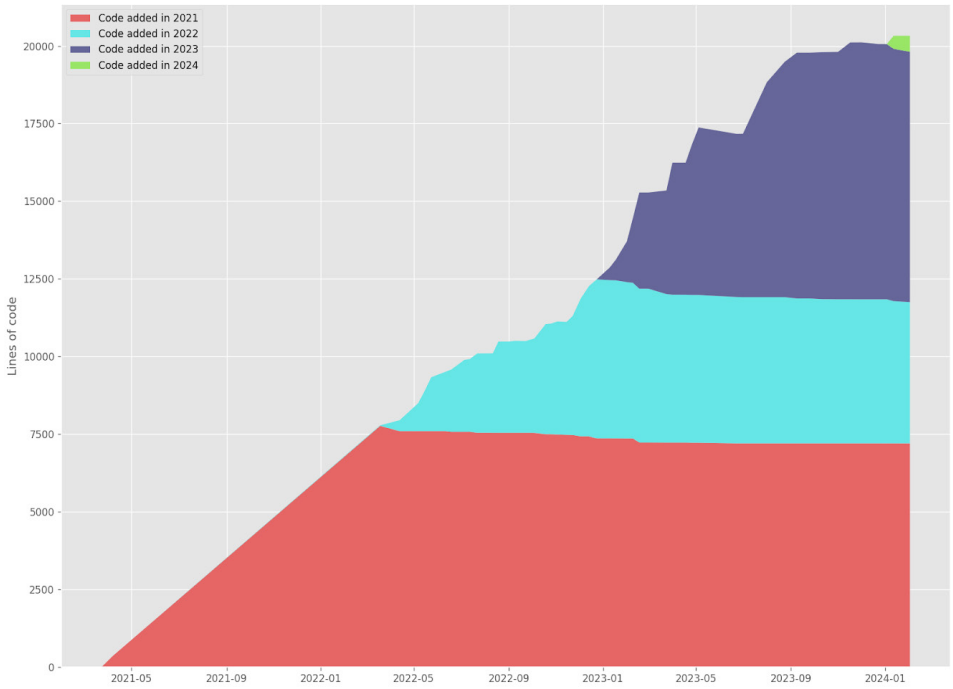
Before VADER, all variable change code necessary for a model needed to be implemented in the model's JEDI interface code. Moving this code to a generic repository not only reduces the size of the model-specific interface layer, but also enables code-reuse, increases visibility, and encourages a common design pattern. VADER can be thought of as filling a similar role in JEDI as the UFO repository, only for variable changes instead of forward operators.

The basic building block of a VADER variable change is a class of objects called Recipes. A Recipe produces a single variable (the "product"), given a set of required input variables, sometimes called "ingredients". An instance of VADER is created with a "cookbook", which defines which Recipes are available for use in that VADER instance. When invoked, the VADER algorithm calculates how it can produce the most number of the desired output variables given its input variables and the cookbook. It will chain together Recipes and produce intermediate variables if that will help it produce more of the requested variables. If Vader is unable to produce all the requested variables, it passes back to the caller which variables it was unable to produce, and then the model interface code is responsible for producing the remaining variables.

Because most model repositories were created and functional before VADER existed, adoption of VADER by models is often a process of refactoring existing variable change code, rather than a new implementation.VADER becomes more useful with every model that uses it, but it is also optional for those running on shorter timelines or with limited programming resources. While VADER reduces the size of JEDI model interfaces, users can work with JEDI without it if they don't currently have the bandwidth for the implementation. With limited programming resources, refactoring code can often be prioritized lower than work which adds new capabilities. To the credit of the contributors to JEDI, the amount of code in VADER has nonetheless grown steadily since its introduction.

At this writing, VADER has 30 recipes that have been implemented.

In the future, with continued development efforts, VADER will continue to grow its library of Recipes, and to increase the number of models in which it is implemented. As with JEDI itself, all models see more benefit as it is more widely adopted, making more code that is jointly shared.



Increase in VADER code 2021-24

EDITOR'S NOTE

It's a pleasure to publish this Winter 2024 Edition of the JCSDA Newsletter. Notwithstanding the holiday season, winter tends to be a busy time of year for the Joint Center, and this year was no exception.

One seasonal highlight was the full-day JCSDA Symposium held as part of the annual meeting of the American Meteorological Society (AMS) Annual Meeting in Baltimore, MD on January 31, 2024. Twenty-two oral presentations were made by JCSDA core and partner staff members as well as representatives of the broader community, and over a dozen posters, covering topics ranging from newly developed features and applications of the Joint Effort for Data assimilation Integration (JEDI) and the Community Radiative Transfer Model (CRTM) to observation impact assessments. Both the poster session and the oral sessions were enthusiastically attended, with the latter averaging 70 face-to-face and online participants.
The Symposium also co-sponsored the 10th Annual Speed Networking Event for students and early career professionals on Monday, January 29. Almost 200 students and mentors took part, exchanging questions and ideas for establishing connections with mentors and among peers in order to enhance opportunities for professional growth and developing the future workforce of the environmental prediction enterprise and complementary disciplines.

Most recently the JCSDA Executive Team (ET) Retreat was conducted in Colorado Springs, CO from February 27-29. Members of the ET and the senior JCSDA core staff compiled and reviewed partner agency requirements and priorities and potential resource (staff) allocations to provide a framework for drafting the FY24 Annual Operating Plan for the Joint Center. Science and technical highlights for the last quarter are highlighted in a pair of articles in this issue. One describes the explosive growth of the VAriable DErivation Repository (VADER) since its inception around two years ago, and its capability to "generify" variable changes for a growing host of models. The second describes Dr. H. Zhang's recent visit to compare various quality control approaches for Global Navigation Satellite System Radio Occultation (GNSS-RO).

Last but not least, we've been fortunate to have one new member join the core team, technology transfer and transition team lead Luke Peffers. Luke's biography is featured in this issue as well.

Jim Yoe
Editor

PEOPLE

Luke Peffers

Dr. Luke Peffers is the new Senior Lead of Tech Transfer. Dr. Peffers brings over 24 years of experience as an active-duty service member, a civil servant for the USAF, the Chief Scientist for a DoD contractor, an adjunct professor of Meteorology for Embry Riddle Aeronautical University's Worldwide Campus, the Chief Scientific Officer (CSO) of Tomorrow.io, and now as Senior Lead of the Joint Center for Satellite Data Assimilation (JCSDA) Technology Transfer program. Dr. Peffers earned his Ph.D. in Atmospheric Science in collaboration with the U.S. Air Force Technical Applications Center (AFTAC). After earning his Ph.D., Dr. Peffers worked at AFTAC and became the branch chief of the Meteorological Modeling and Analysis team that is responsible for designing and operating weather modeling systems that are used to monitor compliance with multiple global nuclear test ban treaties. Dr. Peffers then joined STAR, LLC to serve as Chief Scientist where he managed numerous DoD contracts and projects involving the development and sustainment of operational weather models and weather-driven Chemical, Biological, Radiological, and Nuclear (CBRN) forensic analysis and forecasting systems for various agencies within the DoD and international governments. At Tomorrow.io, Dr. Peffers led the Tomorrow.weather division of the company that is responsible for building operational weather analysis and forecasting systems that leverage Tomorrow.io's satellite constellation.

SCIENCE CALENDAR

TITLE	DATE	LOCATION	WEBSITE
Adjoint Workshop	May 2024	Lake George, NY	https://www.adjoint-workshop.org/
NOAA ACX Science Team Meeting	May 7-9, 2024	College Park, MD	https://csl.noaa.gov/nacs/2024geoxo-acx-stm/
8th WMO Workshop on the Impact of Observing Systems	May 27-30, 2024	Norrköpping, Sweden	https://community.wmo.int/en/meetings/8th-wmo-impact-workshop-home
International Workshop on Radiative Transfer Models for Satellite Data Assimilation	June 10-17, 2024	Beijing, China	
International Precipitation Working Group	July 15-18, 2024	Tokyo, Japan	https://www.eorc.jaxa.jp/IPWG/

CAREER OPPORTUNITIES

Opportunities in support of JCSDA may be found at www.jcsda.org/news as they become available.