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Geoscientific Model Development Discussions

Interactive comment on "High Performance Software Framework for the Calculation of Satellite-to-Satellite Data Matchups (MMS version 1.2)" *by* Thomas Block et al.

Anonymous Referee #1

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Review of Geoscientific Model Development Discussions submission entitled: High Performance Software Framework for the Calculation of Satellite-to-Satellite Data Matchups (MMS version 1.2) Paper authors: Thomas Block, Sabine Embacher, Christopher J. Merchant, and Craig Donlon Manuscript DOI: 10.5194/gmd-2017-54

Paper summary: This paper aims to describe a novel way of leveraging mathematical geometric calculations and a multi-processor workflow to efficiently cross-compare large volumes of geo-referenced data between two satellite sensors. The authors indicate that this type of satellite-to-satellite collocation has historically been performed manually or by processing workflows that are highly customized for specific satellite

platform pairs. The new matchup system being put forth by this paper will leverage database storage and parallel processing for optimizing satellite-to-satellite matchups via complex geometric calculations to reduce the number of varying dimensions. This system is scalable from laptop to server cluster implementations, and easily supports the addition of new satellite platforms. The satellite-to-satellite matchup system being described is capable of implementing core matchup criteria (temporal and spatial coincidence thresholds) and additional screening criteria (viewing geometry, cloud filtering, etc), saving all co-incident satellite data matchups as independent, traceable data sets of symmetrical extracts of satellite data. This system operates in a two-stage process: ingestion of satellite metadata into the database and comparison of two selected satellite sensors for matchups. This second stage has a few component processes: coarse and fine matchup selection filtering, application of additional screening criteria, and matchup data set storage and extraction. The coarse matchup selection is the novel technique being described by the authors who are leveraging a new technique called the time axis approach to pre-select likely matchup candidates, thereby reducing the number of times the fine (traditional, yet time consuming) matchup selection process is invoked. The time axis approach relies on two assumptions: satellites move locally with constant velocity on a predictable orbit and the measurements per sampling interval can be described relative to the satellite's pointing geometry. Using these two pieces of information, intersection locations between two satellites' views can be efficiently predicted solely as a function of time, reducing the number of variables that must be compared to identify a potential matchup candidate. This simplification does add some complications and error potential, some of which the authors address by increasing the temporal matchup-identification thresholds, but some of this error the authors indicate they do not fully understand. The authors present a comparison of their multi-step method versus the traditional matchup derivation method, finding that their method out-performs the traditional method, but has the most benefit when comparing satellites with large swaths and high data volumes. The authors conclude with a discussion of the satellite-to-satellite matchup code's framework, availability, and additional filtering and screening tools, as well as the output data set formatting.

Technical corrections and Feedback: âĂć Grammatical suggestions: âŮę Page 2, line 2: "…which may be on the order of a hundred Terabytes in size." âŮę Page 2, line 2: "A highly-performing search…" âŮę Page 3, line 1-2: "…that has already generated various long-term sensor matchup datasets…" âĂć Figure, table, text, and reference suggestions: âŮę Page 8, Table 1: Please make the distinction between the results shown in the last two rows of this table more obvious by changing the first columns entries to "Time Axis Method (section 4.1)" and "Full Access Method (standard approach)". âŮę Page 12, lines 20-21: Please describe the z-dimension/matchup index more thoroughly. Is this a representation of time? Or time difference? Or something else?

Review Evaluation Questions: 1. Does the paper address relevant scientific modelling questions within the scope of GMD? Does the paper present a model, advances in modelling science, or a modelling protocol that is suitable for addressing relevant scientific questions within the scope of EGU? a. Yes 2. Does the paper present novel concepts, ideas, tools, or data? a. Yes 3. Does the paper represent a sufficiently substantial advance in modelling science? a. Yes 4. Are the methods and assumptions valid and clearly outlined? a. Yes 5. Are the results sufficient to support the interpretations and conclusions? a. Yes 6. Is the description sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? In the case of model description papers, it should in theory be possible for an independent scientist to construct a model that, while not necessarily numerically identical, will produce scientifically equivalent results. Model development papers should be similarly reproducible. For MIP and benchmarking papers, it should be possible for the protocol to be precisely reproduced for an independent model. Descriptions of numerical advances should be precisely reproducible. a. Yes 7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? a. Yes, where relevant 8. Does the title clearly reflect the contents of the paper? The

model name and number should be included in papers that deal with only one model. a. Yes 9. Does the abstract provide a concise and complete summary? a. Yes, the abstract, while a bit shorter than most, is complete. 10. Is the overall presentation well structured and clear? a. Yes 11. Is the language fluent and precise? a. Yes, but with the exceptions noted in the Technical Corrections and Feedback section above. 12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? a. Yes 13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? a. Yes, but with the exceptions noted in the Technical Corrections and Feedback section above. 14. Are the number and quality of references appropriate? a. Yes, however, the reference list is a bit short, but I do not see any unsubstantiated statements where additional citations would be required. 15. Is the amount and quality of supplementary material appropriate? For model description papers, authors are strongly encouraged to submit supplementary material containing the model code and a user manual. For development, technical, and benchmarking papers, the submission of code to perform calculations described in the text is strongly encouraged. a. Yes, while the code itself is not included, references and links to its location are provided, and an extensive user manual is provided.

Please also note the supplement to this comment:
https://www.geosci-model-dev-discuss.net/gmd-2017-54/gmd-2017-54-RC1-supplement.pdf

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