EGU24-2675, updated on 19 Jan 2025
https://doi.org/10.5194/egusphere-egu24-2675
EGU General Assembly 2024

AGSDF: A Multiscale Attention Guided DeepOptimization Network for Spatiotemporal Fusion

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Satellites strive to strike a delicate balance between temporal and spatial resolution, thereby rendering the achievement of high resolution in both aspects challenging. In particular, Earth observations at sub-daily intervals are more diffuclt. Spatiotem-poral fusion algorithms have emerged as a promising solution to tackle this challenge. However, the current spatiotemporal fusion methods still face a critical challenge: accurately and efficiently predicting fine images in large-scale area applications, while en-suring robustness. To address this challenge, the study proposes a multiscale Attention-Guided deep optimization network for Spatiotemporal Data Fusion (AGSDF) method. An optimization strategy is employed to directly predict high-resolution image at multi-scales based coarse-resolution image. Specifically, a varia-tion attention module is proposed to focus on the edges and tex-tures of abrupt land cover changes. The spatiotemporal fusion kernel is developed to provide essential spatial details for spatio-temporal fusion. Furthermore, the implementation of spatiotem-poral fusion at multiple scales improves the reliability of predic-tion. The performance and robustness of AGSDF were evaluated and compared to nine methods at six sites worldwide. The exper-imental results indicate that AGSDF achieves a better overall performance in quantitative accuracy assessment, transfer ro-bustness, predictive stability and efficiency. Consequently, AGSDF holds the high potential to produce accurate remote sens-ing products with high temporal and spatial resolution across extensive regions.