Issues with GIMMS LAI4g in Australia

Short comment on “Spatiotemporally consistent global dataset of the GIMMS Leaf Area Index (GIMMS LAI4g) from 1982 to 2020” by Cao, S, Li, M, Zhu, Z, Zha, J, Zhao, W, Duanmu, Z, Chen, J, Zheng, Y, Chen, Y. Earth Syst. Sci. Data Discuss. 2023: 1-31. http://doi.org/10.5194/essd-2023-68

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First of all, we would like to commend Cao et al. (2023) for developing a long-term Leaf Area Index (LAI product) which is an important contribution to earth sciences scientific research. While investigating LAI dynamics over the Australian continent at the catchment scale (BoM, 2022), we noticed some unusual LAI values in Alpine catchments (southeast Australia) in the early 1990s. We would like to showcase these issues to Cao et al. (2023), noting that we have not tried to systematically evaluate errors in GIMMS LAI4g and the findings came from our investigations into catchment non-stationarity, for which vegetation plays a key role (Fowler et al., 2022; Gardiya Weligamage et al., 2023). Therefore, we do not investigate this issue in detail and have only scratched the surface about occurrence and speculate about the causes of the issues. We leave the authors to further verify if the issues occur in other continents and other years.

Alpine catchments in Australia generally have snow cover during the austral winter months (June to August). The example in Figure 1 showcases this issue for catchment ID 221201, located in the Alpine area, LAI values during the early 1990s seem unusually high.

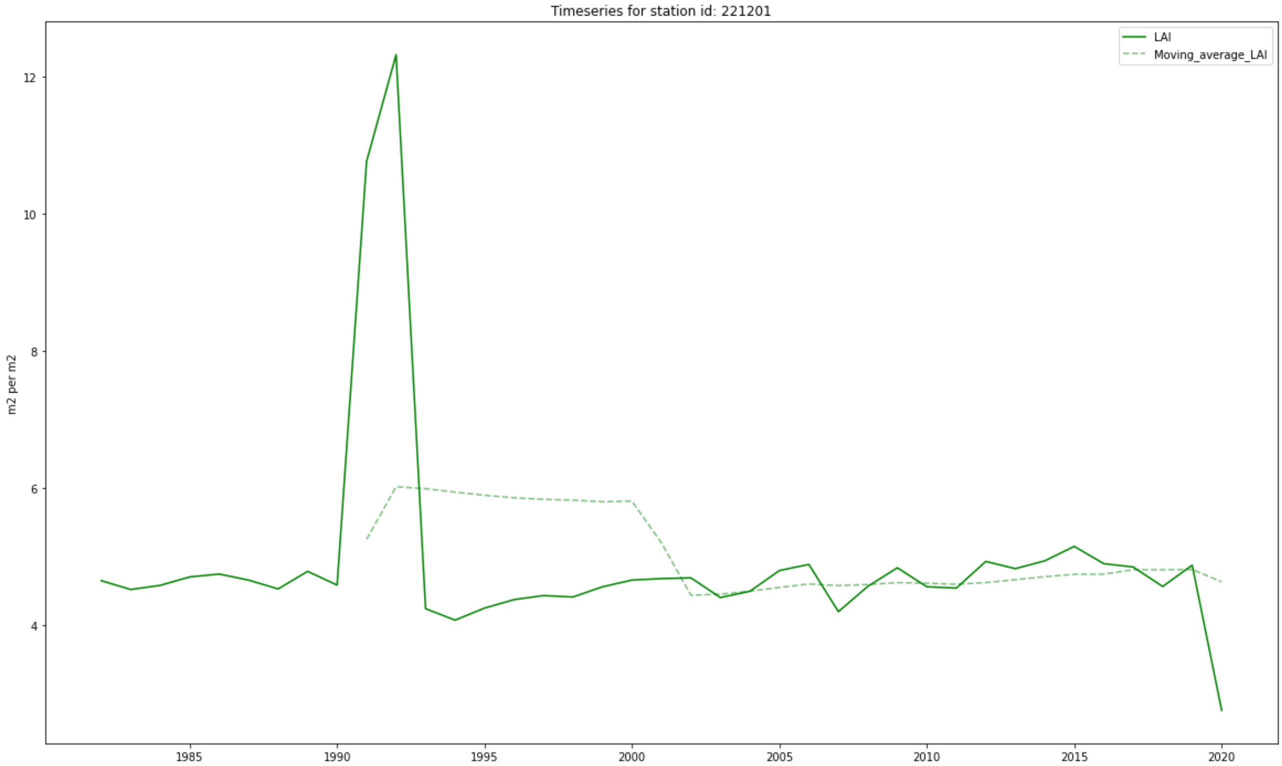

Figure 1 Annual-averaged Leaf Area Index from GIMMS LAI4g (green solid line, and green dashed line showing a 10-year moving average) LAI for catchment ID 221201. Note the high LAI catchment averaged values in the early 1990s.

The unusually high LAI values, averaged at the annual frequency are widespread and include intermittent lakes, see Figure 2 for 1992.

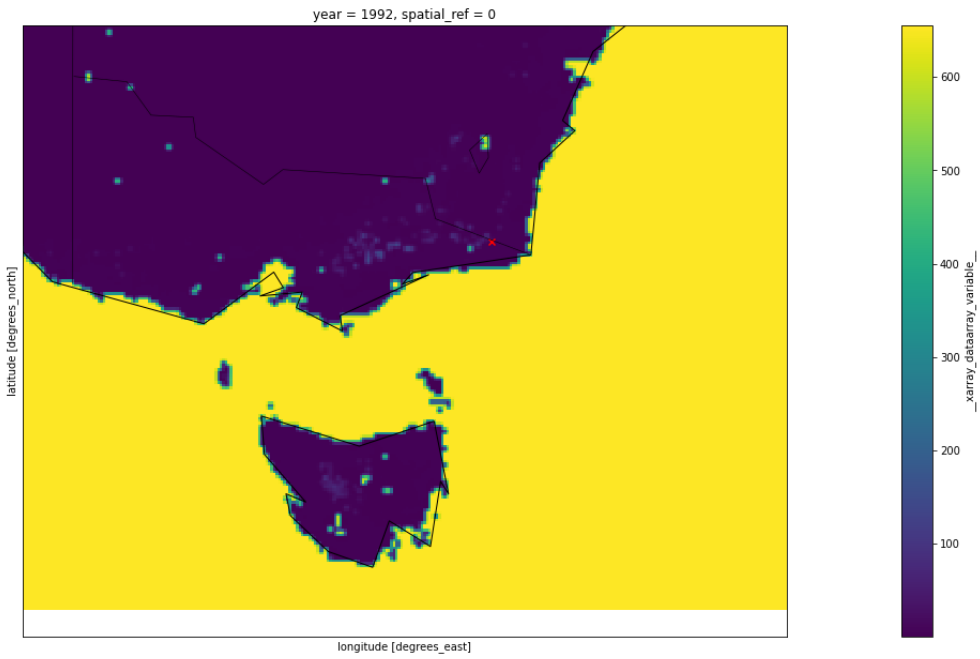

Figure 2 Annual-averaged pixel LAI for southeast Australia, the colour ramp units are in m²/m².

We further assessed this by obtaining average continental values during August (when snow cover is generally at its largest extent) of 1991 and 1992, and masking all pixels with LAI values >50, see Figure 3. Besides Alpine areas with snow cover, the unusually high values are evident in intermittent dry lakes as well.

Figure 3 August-averaged pixel LAI for Australia, LAI values above 50 are shown in in yellow. Red dot in the southeast denotes a pixel used to assess the entire timeseries.

We picked one yellow-masked pixel in the Alpine area to assess this issue in years other than 1991 and 1992. Figure 4 suggest that the issue is not present in other years.

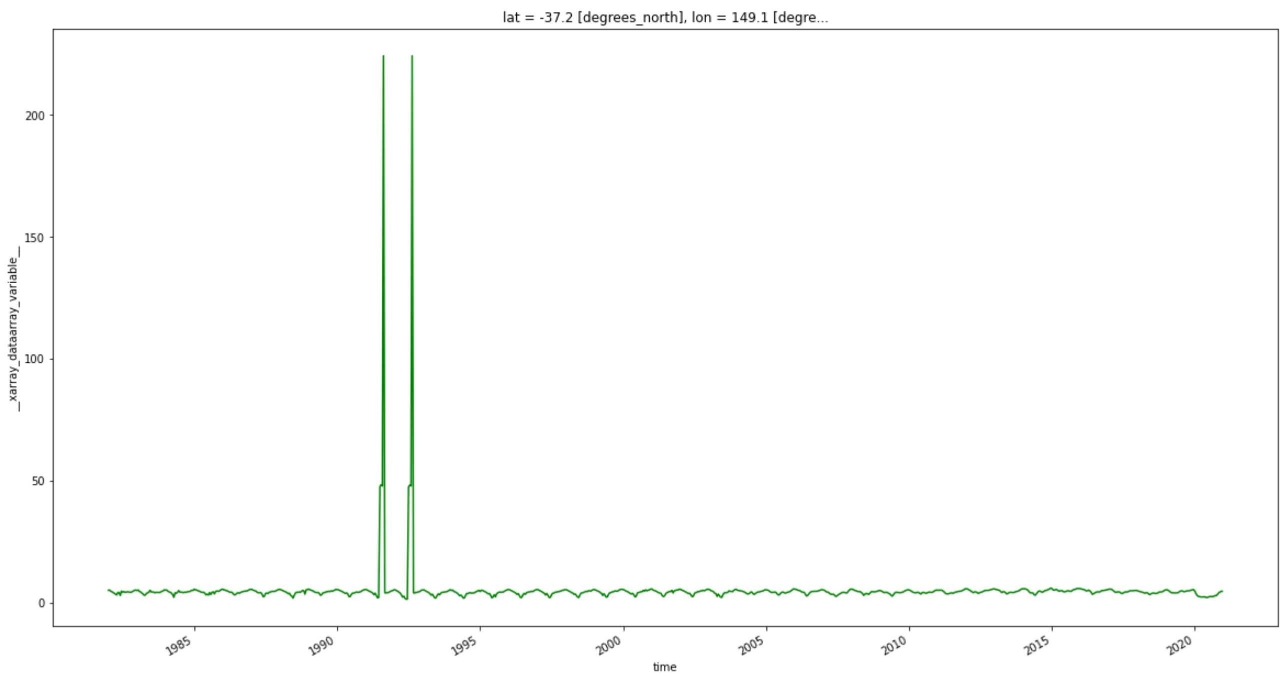

Figure 4 Monthly pixel LAI for red pixel in Figure 3, Y-axis units are in m^2/m^2.

The limited investigation of high LAI values in 1991 and 1992 suggest that this is limited to landscapes with high reflectance (snow, dry lake beds) and that filtering these values as for other years is a suitable solution.

References

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