Rooting Depth and Plant Hydraulic Resistance Proxy Products

Product description

The rooting depth (Z_r) and plant hydraulic resistance (R_{plant}) proxy products are developed based on the daily microwave vegetation optical depth (VOD) from AMSR-E and AMSR2 (Du et al., 2017) over 2002-2011. The R_{plant} is the reciprocal of the plant hydraulic conductance (K_{plant}, $R_{plant} = 1/K_{plant}$). The two products are static, and are at a spatial resolution of 0.25-degree, and the desert area is masked out (i.e., no data). The spatial pattern of the Z_r proxy is compared against other available Z_r products in Figure 1, and that of the R_{plant} proxy is presented in Figure 2. Note that both the Z_r and R_{plant} proxy are just surrogates of the rooting depth and plant hydraulic resistance, respectively, rather than actual values. Therefore, they may not match *in-situ* observations well (could be at different magnitudes), but they overall preserve the spatial variations across the globe.

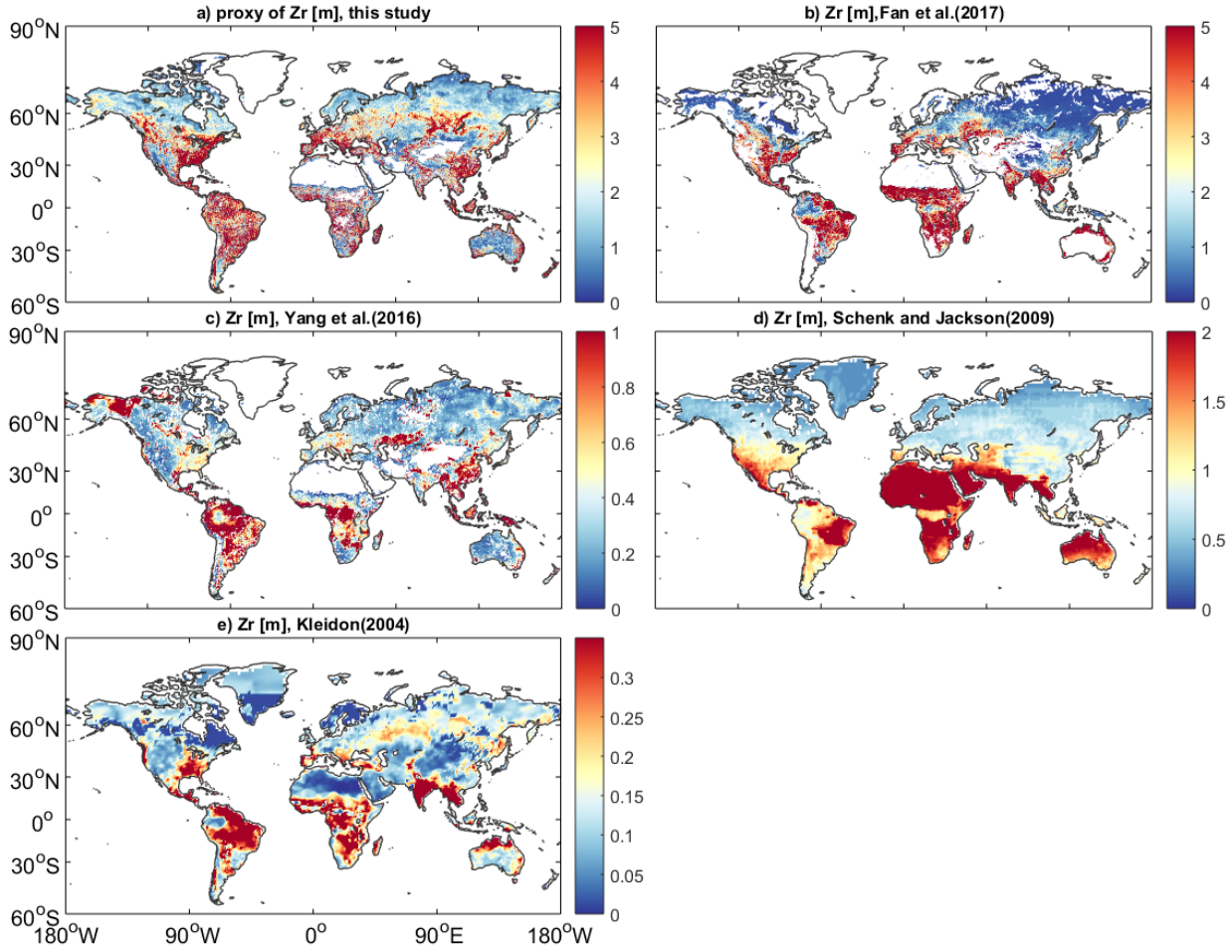

Figure 1 Spatial variations of rooting depth (Z_r) from different sources: a) proxy of Z_r derived from this study assuming linear relationship between soil water content and soil water potential; b) effective Z_r from Fan et al. (2017); c) effective Z_r from Yang et al. (2016); d) soil depth containing 95% of all roots (Schenk and Jackson, 2009); and e) hydrological depth of rooting zone in meter H_2O of plant-available water inferred from assimilation of satellite-derived absorbed photosynthetically active radiation (Kleidon, 2004).

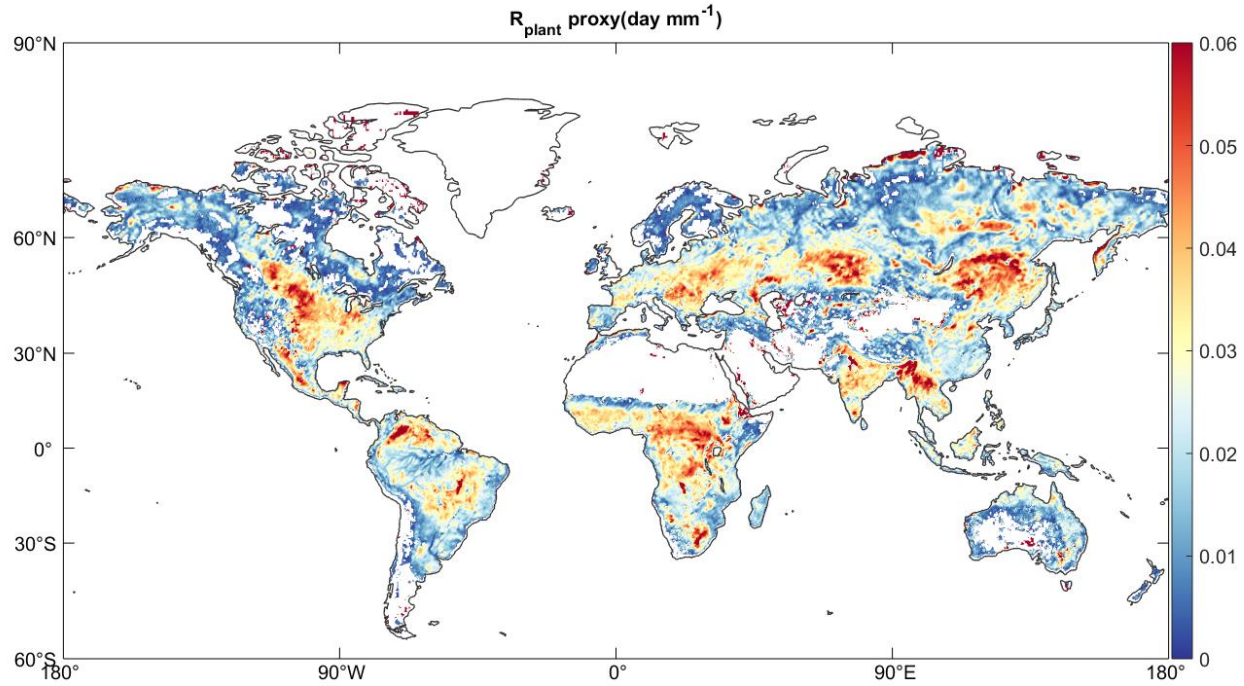

Figure 2 Spatial pattern of R_{plant} proxy.

File Format

This products are provided in the format of Matlab structure array. It includes two files:

1) Z_r_proxy.mat, which contains the rooting depth proxy data (m) in this work and associated latitude and longitude.
2) R_{plant}_proxy.mat, which contains the plant hydraulic resistance proxy data (day mm^{-1}) in this work and associated latitude and longitude.

Along with the proxies of Z_r and R_{plant} that are produced in this work, other four rooting depth products shown in Figure 1 above (Fig. 1b-1e) are also provided:

1) Zr_Fan.mat, where effective rooting depth in Figure 1b above and associated latitude and longitude are included.
2) Zr_Yang.mat, where effective rooting depth in Figure 1c above and associated latitude and longitude are included.
3) Zr_Schenk.mat, where soil depth containing 95% of all roots in Figure 1d above and associated latitude and longitude are included.
4) Zr_Kleidon.mat, where hydrological depth of rooting zone in meter H_2O of plant-available water in Figure 1e above and associated latitude and longitude are included.

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Data Usage and Citation

The rooting depth and plant hydraulic resistance proxy products are freely available for any non-commercial application. Redistribution of these data without prior permission from the developers is prohibited. Developers request to be contacted and invited to collaborate in any research study that uses the products here so they can provide guidance as they have the best knowledge of the products.

Users are asked to **cite the following publication** when using these products:

Liu, Y., Konings, A.G., Kennedy, D. and Gentine, P., 2021. Global coordination in plant physiological and rooting strategies in response to water stress. *Global Biogeochemical Cycles*, 35(7), p.e2020GB006758.

Contact

All questions related to the rooting depth and plant resistance proxy products should be directed to the developer Dr. Yaling Liu (cauliuyaling@gmail.com) or the research group lead Prof. Pierre Gentine (pg2328@columbia.edu).

References

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