Interactive comment on "The Global Long-term Microwave Vegetation Optical Depth Climate Archive VODCA" *by* Leander Moesinger et al.

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As a byproduct of microwave-based surface soil moisture (SSM) retrieval, vegetation optical depth (VOD) is closely related to total vegetation water content (VWC) which is an effective estimator of above-ground biomass (AGB). Time series of VOD dataset serves as an important supplement to vegetation change studies which are previously based exclusively on optical sensor data such as GIMMS3g NDVI. One of the biggest concerns for such a time series dataset generation is the issue of temporal consistency. This article proposes an improved Cumulative Distribution Function (CDF) matching technique inherited from CCI SSM generation, and provides a 30-year (maximum and to be elongated with time) Vegetation Optical Depth Climate Archive (VODCA). Due to slower saturation effects than and other claimed advantages over optically based

indices, the three VOD datasets will surely benefit the science community in the field of global and regional vegetation changes.

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(1) It is interesting to find that Figure 11 shows an increase of globally-averaged LAI-VOD temporal correlation in the order of C-, X-, and Ku-band. Is this pattern related to the penetration depth of microwave bands, i.e., Ku-band contains more information on top-layer leaves which are captured by LAI? While Figure 6 shows a decrease of globally-averaged LAI-VOD spatial correlation in the same order. Is this pattern related to the relatively homogenous C-band penetration depth at global scale?

(2) Instead of jointly retrieving VOD and SSM, is it possible to retrieve VOD using other sources of SSM data, e.g., GLDAS, SMOS and SMAP as inputs? An increase in SSM data quality/consistency likely improves the retrieval of VOD.

(3) It is a common practice to reduce random errors (noises) by averaging multi-sensor concurrent data. Is it your plan to incorporate more microwave sensors in the future versions of VODCA? Such sensors can include, e.g., FY-3B (X band from 2011-07-12 to present) and FY-3C (X band from 2014-05-29 to present).

(4) Do the anisotropic effects of vegetation absorption/emission play a role in VOD retrieval? That is, to what extent the cosine mapping function (in eq. 2) applies in the 0.25° grid, because this function is derived for horizontally homogeneous canopy. This assumption is generally unsatisfied within the 0.25° grid on the earth surface. Thus, the accuracy of VOD may differ with incidence angle. The MODIS maximum-value compositing NDVI (and then LAI), however, is inclined to select near-nadir pixels. In this sense, the temporal consistency is well maintained. I wonder if LAI-VOD temporal correlation is also affected by land surface heterogeneity which decreases the accuracy of VOD.

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Minor comments

Page 1, Line 19; full stop missed

Page 1, Line 23; delete redundant 'parts'

Page 2, Line 9; 'Vegetation optical depth' should be 'Vegetation Optical Depth'

Page 2, Line 18; 'analyzes' should be 'analyses'

Page 3, Line 18; 'Distribtion' should be 'Distribution'

Page 4, Line 27; 'AQUA' should be 'Aqua'

Page 5, Line 11; add a space between 'VOD' and 'from'

Page 5, Line 12; in . . . orbits

Page 6, Table 1; add the unit of GHz

Page 6, Line 7; full stop missed

Page 6, Line 9; 'us' should be 'use'

Page 9, Line 5; 'cdf' should be 'CDF'

Page 11, Line 17; 'is' should be 'are'

Page 13, Line 1; full stop missed

Page 14, Figure 7; full stop missed in the caption

Page 17, Line 10; delete 'is'

Page 18, Line 9; 'Figure 11' should be 'Figure 12'

Page 19, Line 2; please explain the meaning of number1|number2? Does 1|1 mean a contradicting trend?

Page 21, Line 14; 'implicit' should be 'implicitly'

Page 21, Line 19; the three merged VOD datasets are downstream reprocessed satellite products, and it may be inappropriate to be called 'observations'.

Last, use 'band' or 'frequency' throughout the manuscript.