A METHOD TO IMPROVE THE RELATION BETWEEN THE BIOPHYSICAL VARIABLES

P. Rossello, M. Weiss, F. Baret

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The transfer functions are applied over all band combinations. The band combination giving the best results is selected to estimate the values of the biophysical variables over the whole site. This method is operational and the results of the multiple robust regression are pertinent, but the dependency between the estimated variables is questionable because of the linear nature of the individual transfer functions. For example, the relation between LAIeff and fAPAR is linear whereas it should a priori be exponential.

To improve the relation between the biophysical variables, three methods were tested using the reflectance to calculate LAIeff and fAPAR values with the transfer functions (Figure 1):

- method A: XS1, XS2, XS3, XS4. This method was used up till now;
- method B: XS1, XS2, XS3, XS4, Red*NIR;
- method C: XS1, XS2, XS3, XS4 with LAIeff = klog(fAPAR), where k is fitted using the measured values.

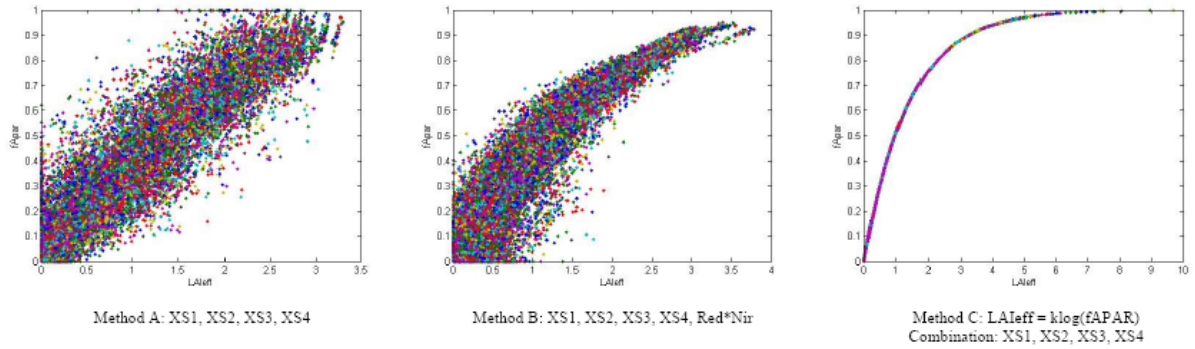

Figure 1. Relations between LAIeff and fAPAR over the whole site using different methods (Alpilles site, 07/2002)

The results show that the relation between LAIeff and fAPAR is linear with method A and exponential with methods B and C. The addition of the Red*NIR band to the initial combination (XS1, XS2, XS3, XS4) is enough to improve the relation between LAIeff and fAPAR. Method B produces a residual information while the relation resulting from method C is a perfect exponential curve (mathematical connection).

The VALERI project aims at validating biophysical products derived from medium or large swatch sensors. Therefore, the aggregation of the data (at 1 km resolution) resulting from the different methods was carried out to estimate the value of the biophysical variables (Figure 2 and Figure 3).

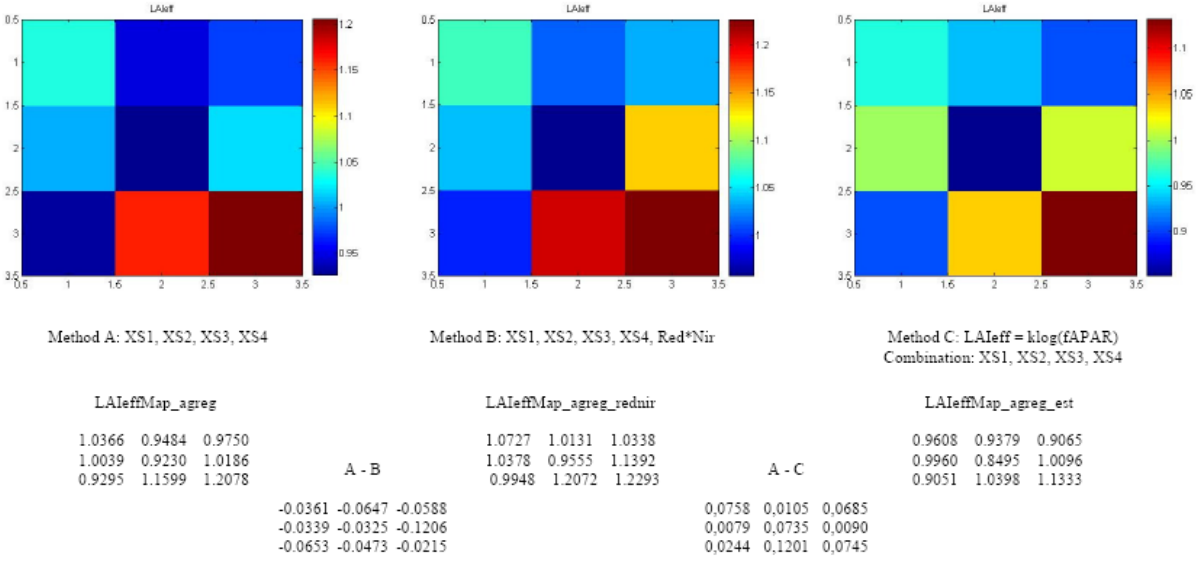

Figure 2. Estimation of the LAIeff value at 1 km resolution (Alpilles site, 07/2002)

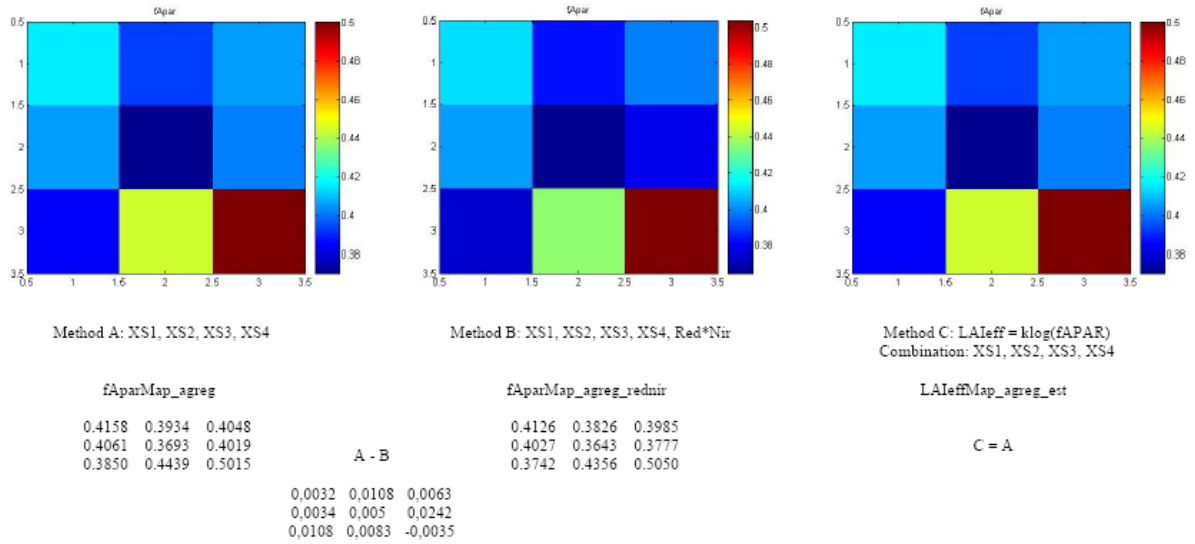

Figure 3. Estimation of the fAPAR value at 1 km resolution (Alpilles site, 07/2002)

Finally, the results show that while the incidence of the method is very significant at high spatial resolution, it is actually minimal at medium or large resolution. This is important since the previous processes within the framework of the VALERI project[1] is based on method A. Therefore, the previous processes stay pertinent at medium or large resolution, in agreement with the main VALERI objectives.

However, an additional dimension is now added to the all the available band combinations. The multiple robust regression with the interaction of the Red*NIR band (method B) optimizes indeed the transfer functions.

[1] for more information: http://www.avignon.inra.fr/valeri