Hydrol. Earth Syst. Sci. Discuss., 5, S228–S232, 2008
www.hydrol-earth-syst-sci-discuss.net/5/S228/2008/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Estimation of vegetation cover resilience from satellite time series" *by* T. Simoniello et al.

Anonymous Referee #2

Received and published: 23 April 2008

Simoniello et al. present an interesting work to characterize the resilience of vegetation-cover by NDVI time series based on 8 x 8 km^2 resolution AVHRR data.

There has been an anonymous referee report #1 which comes to very similar results as and is fully supported by this report which goes a little bit more into details. Unfortunately there are a few statements which can not be easily understood without knowing the paper of Lanfredi et al. of 2004. In order to make the paper self-explanatory it is suggested to add a number of explanatory remarks rather than refer to Lanfredi et al.

The principal question is what one has to understand under "resiliance of vegetation cover" in view of the result of other investigations that the recovery time of the NDVI after a drought or fire is about three years (which does not imply that the same vegetation

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is grown during this time!). In fact, what is determined is the duration of the deviation of the greenness of the earth surface from a reference data set or to be more precise the deviation from a trend prescribed by a reference data set of ten years. This can have different reasons: It could be that the vegetation recovers from a shock, maybe the reference years were favourable for the vegetation, maybe what we see is the change of precipitation or a change of land-use at the end of the reference period. If we look at the final product, fig. 5, we see that the Basilicata remains negative for twelve years. But how much negative is not indicated neither is clear when precisely the deviation started within the ten years reference set. It could even been that within these twelve years there is an upward trend though the NDVI never reached the level of the reference years again. There certainly is no continuous downward trend of vegetation cover. If this would be so, then after twelve year there would be a desert.

The EUROKADS (1km resolution data set) is not fully evaluated with respect to the Basilicata area and as long as we do not exactly know, how the GIMMS is used to compile the annual data values it is also not legitimate to draw any conclusions or to make any comparisons, but sporadic results obtained for a part of the Basilicata shown in the following table do so far not underscore that there is a tendency towards desertification or instability though the peak values seem to shift.

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Decadal NDVI-values around its annual peak for a section of the Basilicata derived from the EUROKADS			
Decade	NDVI 1989	NDVI 1995	NDVI 1998
8	0.37	0.40	0.38
9	0.44	0.41	0.39
10	0.47	0.47	0.41
11	0.42	0.47	0.47
12	0.42	0.41	0.46
13	0.41	0.48	0.42
14		0.35	0.46
15			0.40
16			0.32

In section 3.1 it is said that the data are reprojected. Here the question arises how representative the new pixels are for the area and how accurate they fit the CORINE data set. Already by averaging (or selecting one out of ?) the 64 original 1 km data it is questionable how accurate the new pixels are registered. A comparison of the data set with the 1 km data set used by Lanfredi would be interesting.

Then the data are composed into annual maps. What does MVC stand for? The lines 16–19 are not clear with respect to data set which is constructed: Is this a sequence of annual sums of the NDVI, of annual averages of the NDVI, or a sequence of the annual maxima of the NDVI (as suggested by the line 19)? Obviously at line 7, page 519, by NDVI(x,y,t) [would it not be better to write NDVI(x,y;t)?] it is meant by the phrase “time t” the year t (t = 1, 2, 3, ... 24, respectively 1982 ... 2003).

What follows in lines 9–14, page 519, needs a little bit of sharpening. If it is understood correctly, first a reference data set is established using the trend of the years from

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1982 to 1991 (compare also page 521, line 15). Then: “The sign .... lasts until inter-annual variations do not integrate destructively”. Please explain the phrase “destructive integration”. Referring to line 1 at this page (519) “the signs lasts as long as the starting value (within the reference period?) is not reached again. In some lines it is suggested that the reference period provides a “level” or even a “value”, in others a “trend”. The question which follows is, whether from one year to the other the trend is “broken” or whether the “level” of the reference period is reached (both changes may occur due to a fluctuation, line 13). Line 12–14 would, maybe, read better: “... the trends of those sites are classified as persistent, for which the current inter-annual change does not break the previously estimated trend (which means: reach the level or the trend of the reference period again?) or change the sign of the deviation from the reference value”. If it is written “ ... change its sign” (line 13) then this would occur in the year of maximum deviation from the reference value not at the return to the reference value. Please explain what is precisely meant here.

With the “surface s(x,y;t) is it meant the average of the years 1982-1991? Then it should be written s(x,y;0,t). So the trend within the years 1982–1991 forms the surface s(x,y;t_i) and determines the initial value +1 or -1. In line 22 is t_i identical with the initial time (line 18), the period 1982–1991, or is it the year prior to the present year t (then it would be clearer to write t_j; same in line 25)?

Is line 18-20 to be understood as follows: First a surface s is constructed of the years 1982–1991 and it may be called s(x,y;0,t_i) = s(x,y;1982,1991). Then P(x,y;t_i) = s(x,y;0,t_i). Then a surface s(x,y;0,t_i+1) is constructed and compared with P(x,y;t_i). If s(x,y;0,t_i+1) equals P(x,y;t_i) then P(x,y;t_i+1) is set to P(x,y;t_i). If not, P(x,y;t_i+1) = 0 notwithstanding whether the new value is smaller or larger than the old one. So one obtains a series of values starting with $[P(x,y;t_i)]_{1992}$, ...{P remains constant as long as the deviation remains in the same direction} .... $[P(x,y;t_i)]_{1992+m}$, {change of the sign of deviation} $0_{1992+m+1}$, {zero continues as long as the new trend remains the same because always the previous P was zero}... $0_{1992+m+n}$ {change of trend} {zero continues

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because the following P is identical with the preceding one} .... 0_{2003}.

The n(t) sequence would be 1, 2,3, ... m+1, m+1 .... and finally N(2003) = $\sum_{2003}$ P = m+1. This result would be obtained for all years after 1992+m. But how are the N(t_i) constructed to obtain a decreasing q? Is N(t_i) increasing by one each year a new surface s is generated?

Some typing errors must be corrected. The capitalization of words is not strictly done. In line 3 and 4 of page 518 some words are written with a capital first letter, some with a lower case letter (see also Climate on page 514, line 4, page 523, line 19 and 27 “temperate”). Also page 514, line 10, “potentially”; line 12, “grow”; line 16, “these”; page 524, line 12 “thermo”; page 521, line 18, “indices”.

Experience with the EUROKADS has shown that for each decade entering the time series it has to be visually determined that there are no spurious cloud remains in the image. Automatic de-clouding often is not sufficient to get rid of all cloud remains (see above table: decade 13, 1998, the dip is questionable).

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 511, 2008.