# Satellites for site specific drought monitoring

Waterwatch develops algorithms being capable of calculating various surface energy balance parameters including, transpiration (deficit) and biomass production. Recently the SEBAL-Mic algorithm has been applied to detect drought in China for the period of October 2008 to January 2009. Herein transpiration deficit (Tdef = Tpot-Tact) is used as a drought indicator because it is a quantitative assessment of water shortage experienced by vegetation.

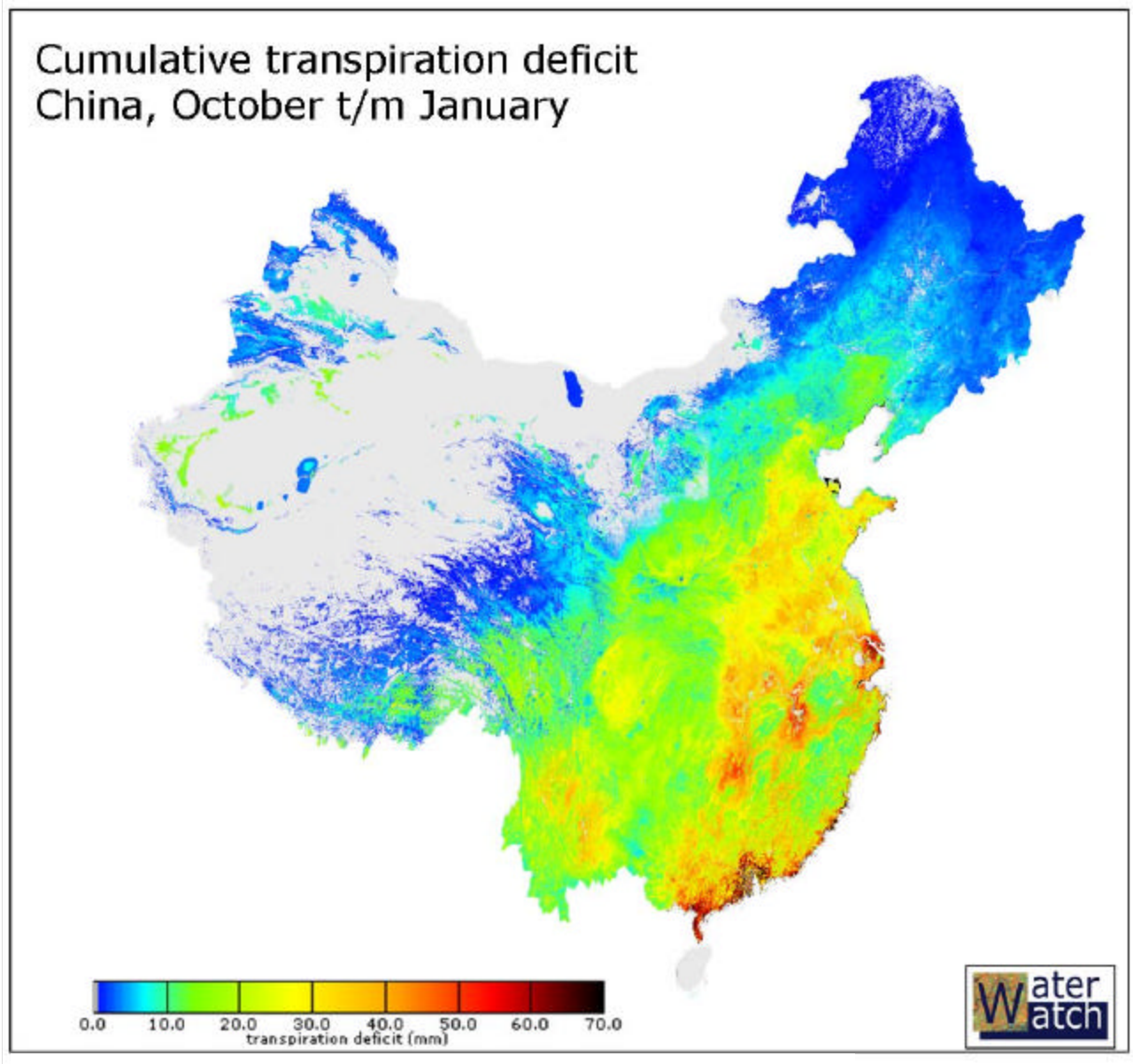



*Figure 1. Cumulative transpiration deficit, over the period of October 2008 to January 2009.*

*Transpiration deficits (Tdef) were computed for entire China with a spatial resolution of 1000m. The figure represents the cumulative Tdef for the period of October 6th to February 1st (2008-2009). Tdef values varied over the country. Particularly the (south) eastern regions suffered from high deficits up to 70 mm. The Hai-basin, located south of Beijing and being an important agricultural area, suffered from transpiration deficits up to 40 mm. Tibet also exhibited some transpiration deficit values. North western China (deserts, elevated areas: dry regions under normal conditions) did not experience drought.*

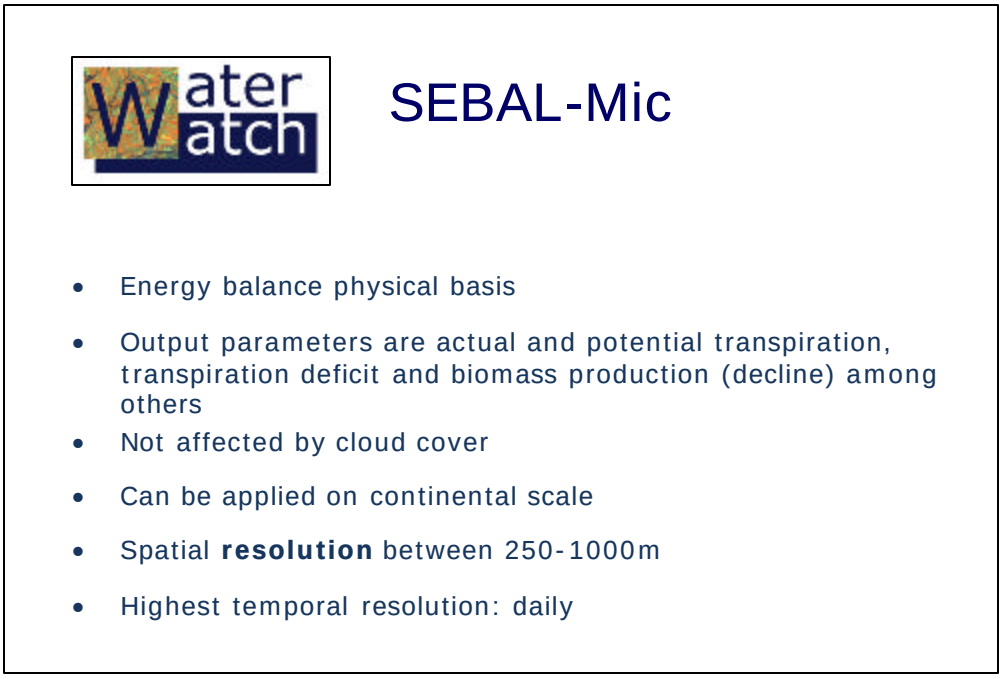
## SEBAL-Mic

SEBAL-mic (Surface Energy Balance Algorithm for Land – Microwave) is evolved from the successful SEBAL model created by Waterwatch. While SEBAL is unprecedented in high resolution and accuracy for river basin studies and crop growth monitoring studies, it is not particularly designed to model large areas. SEBAL-Mic produces the same outputs as SEBAL but at large areas, even up to continental scale.

SEBAL-Mic output is quantitative at discrete space intervals of 0.25 to 1km$^2$ which provides quantitative shortages (mm) due to anomalies in soil moisture, vegetation cover, meteorology and groundwater levels.

SEBAL-Mic can help to:

- identification of local drought afflicted areas which facilitates relief work in general
- identify priority areas requiring detailed studies
- allow comparison between administrative districts for assigning aid relief
- map environmental pressure on crops, wetlands and forests.



## Effects of drought on vegetation

Potential biomass production is one of the SEBAL-Mic outputs. Comparing actual biomass productivity with potential biomass productivity provides a good indication of the effect of drought on growth decline (%) and the overall health status of vegetation.

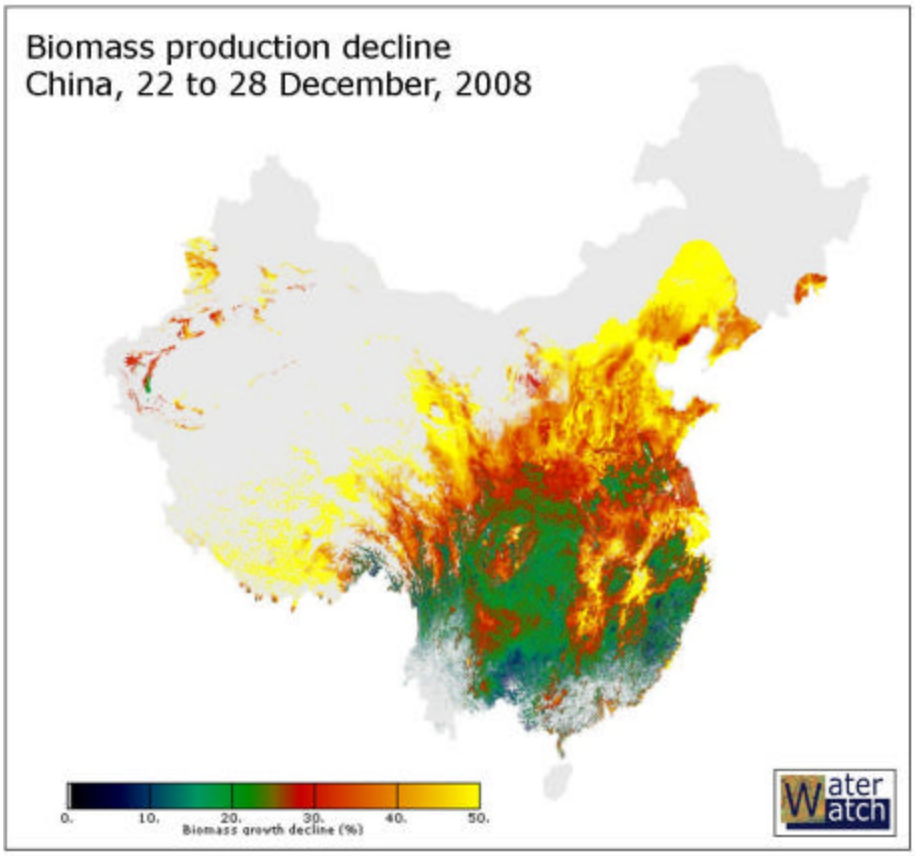


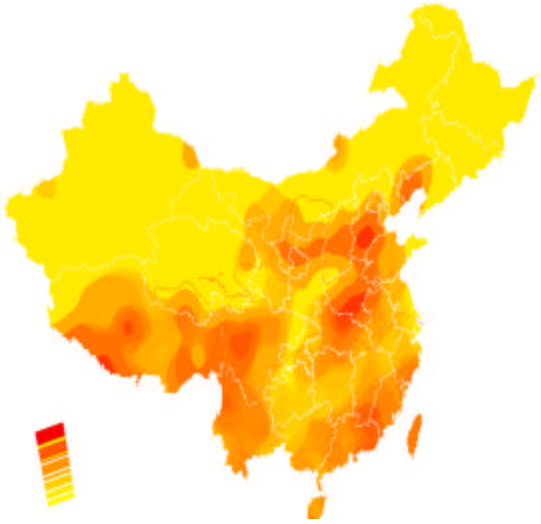

*Figure 2. Biomass production decline (in percentage of the potential biomass production)*

*For the week of 22 to 28 December, a significant part of China is under water stress. Biomass production decline values are in some areas as high as 50 percent. In effect this means that biomass production is only half of what it could have been under optimal conditions. Biomass production decline varies from 20 to 50 percent. Grey areas in the south indicate hardly any reduction in biomass production. In the north large areas also display low values, this is due to low temperatures.*

## Validation

*Figure 3. China drought as published by the BCC. Indicated is the period of 22 to 28 December 2008. Yellow colors indicate normal conditions, red colors indicate extreme drought.*

*Based on a cloud anomaly method, the Beijing Climate Center (BCC) monitors drought conditions in China. According to the BCC, a significant part of China suffered from drought in the period 22 to 28 December. Comparing the SEBAL-mic computation of the same period (figure 2) and the BCC product learns us that the results are generally similar with exception of some areas in south China. Overall both products identify drought affected areas like the Hai basin, Tibet and central China.*



## Vegetation production loss October 2008 – January 2009

SEBAL-mic also computes the biomass production decline. Figure 4 shows the absolute loss, in kilograms per hectare , of vegetation production from October to January.

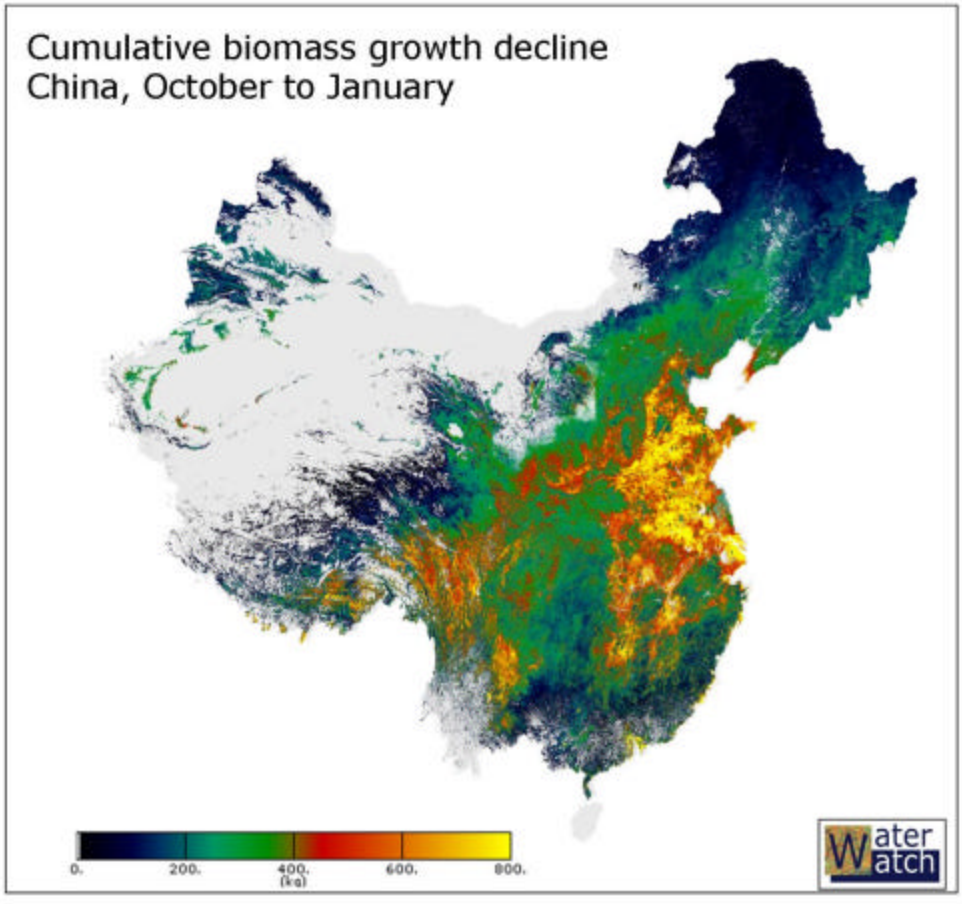



*Figure 4. Vegetation production decline (kg/ha) over the period of October 2008 to January 2009.*

## Further Information

If you are interested in the new SEBAL-Mic tool for drought monitoring or want to have more information regarding the product and its possibilities please contact M.Berghege, m.berghege@waterwatch.nl.

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