Remote sensing of gypsy moth defoliation in evergreen Mediterranean oak forests

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Gypsy moth (Lymantria dispar L.) infestations alternate between years when trees experience little visible defoliation (gypsy moth population numbers are sparse) followed by 2 to 4 years when trees are visibly defoliated. Important defoliation caused by gypsy moth caterpillar occurred on Spring 2004 over the evergreen holm oak (Quercus ilex L.) forests of the Hérault valley (southern France). Spatial variability of leaf damages caused by caterpillars was determined at the end of the attack during July. Leaf defoliation ranged from 10% to 100% over the stands. In some forests, trees were entirely defoliated over significant areas larger than hundreds of hectare. Over the Puéchabon forest where ecosystem carbon flux are measured continuously since 1998, defoliation was estimated at 10 %. All the defoliated trees presented a second flush of growth in late July August provoking a complete recuperation of foliage during Summer.

The objective of this work was to test if the massive defoliation of holm oak forest in the Hérault valley could be detected and precisely mapped through remote sensing data. Two sensors were used, MODIS and SPOT Vegetation. Superimposition of MODIS scenes and direct mapping of Lymantria attack (provided by the Health Forest Department of the Ministry of Agriculture) showed a good adequation between both satellite signal and field observations. The time-course of MODIS derived LAI obtained for the Puéchabon forest over 2003 and 2004 summer period shows a clear effect of Lymantria on LAI from the day of year 170 and the rapid LAI increase during July and August 2004.