

# **An Automatic System for Monitoring and Mapping Forest Fires, Scars and Smoke from Satellite**

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## **Abstract:**

This paper introduces an extensive and end-to-end GIS-based system for fire related applications developed at the Canada Centre for Remote Sensing. The system consists of three components: monitoring fire hot spots, mapping burned scars, detecting fire smokes. They are applied to individual AVHRR daily images, 10-day clear-sky composite images and a combination of the two types of images. During the fire seasons in 1998-1999, the system has been run successfully to obtain and disseminate daily fire information across Canada a few hours after the data reception. So far, 6 years (1994-1999) of across-Canada AVHRR 1-km data have been processed. The performance of the algorithms was evaluated comprehensively using a large amount of conventional fire survey data. The algorithm using single-day AVHRR images can capture almost all fire events, but the accumulated areas of the hot spots are significantly smaller (~30%) than the areas of fire scars reported by fire agencies. Use of clear-sky composites leads to a similar accuracy and suffers more noises in mapping fire scars. To overcome these shortcomings, a new fire mapping method is proposed that uses synergetic information on both hot spot and NDVI composite data. A remarkable accuracy is achieved. For example, the total area (in million hec.) of fire scars reported by fire agencies is 6.57 in 1995 and 1.88 in 1996, and the corresponding numbers determined from satellite are 6.45 and 1.91 respectively. The CCRS algorithm is also compared with several other algorithms designed for global fire detection such as the IGBP-DIS, EOS-MODIS, etc. In addition, the utilities of the SPOT/VGT data in mapping burned area and evaluating the age of burned scars are explored and some unique and potential features will be demonstrated.