

Use of moderate to high resolution multispectral/hyperspectral satellite images for near surface permafrost mapping (Eg. of use of SPOT Image)

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The following example shows how the use of SPOT image has helped to map in detail the current landcover in interior Alaska, and how field data based numerical modeling applied to input from SPOT imagery has potential to predict near surface permafrost conditions along the very important multimodal transportation corridor (Fig A.) proposed to be built in Alaska.

A standard false color composite from SPOT (Fig. B) clearly shows surface features (vegetation, water bodies, landslides, urban development). Landcover classification (Fig. C.) using this SPOT image provides a spatially continuous input on surface vegetation, which along with other parameters such as elevation, slope, aspect, etc. can serve as a proxy for indicating presence or absence of near-surface permafrost.

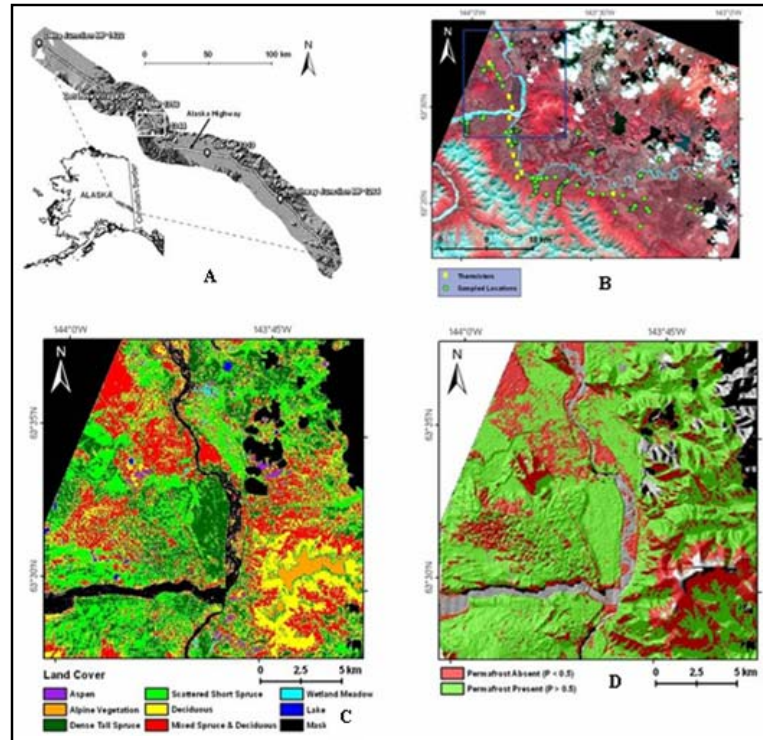


Fig.: Location of the multimodal transportation corridor (A). SPOT image of a part of the corridor (B). Landcover classification derived from SPOT (C). Predictive near-surface permafrost map generated by applying statistical model developed using in-situ filed data on a higher order SPOT derived product (D). *Source Panda et al. (PPP, 2010).*

We developed a statistical model using in-situ field observations that takes vegetation type, topographic aspect and elevation as input and estimates probability of permafrost presence at a given location. Vegetation mapped from SPOT data (Fig. C) and topography derived from digital elevation model, served as input into the statistical model that extrapolates the established permafrost and surface features relationship to get a spatially continuous near-surface permafrost map of the study area (Fig. D). Permafrost is a climate driven phenomena, and in the present time of rapid climate change, permafrost condition is also changing rapidly. To monitor the changes in permafrost condition which has critical environmental and engineering implications and to derive updated permafrost map in a timely manner, availability of real time moderate to high resolution multispectral satellite image is essential.