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## Gold exploration in Limpopo Province using free satellite data

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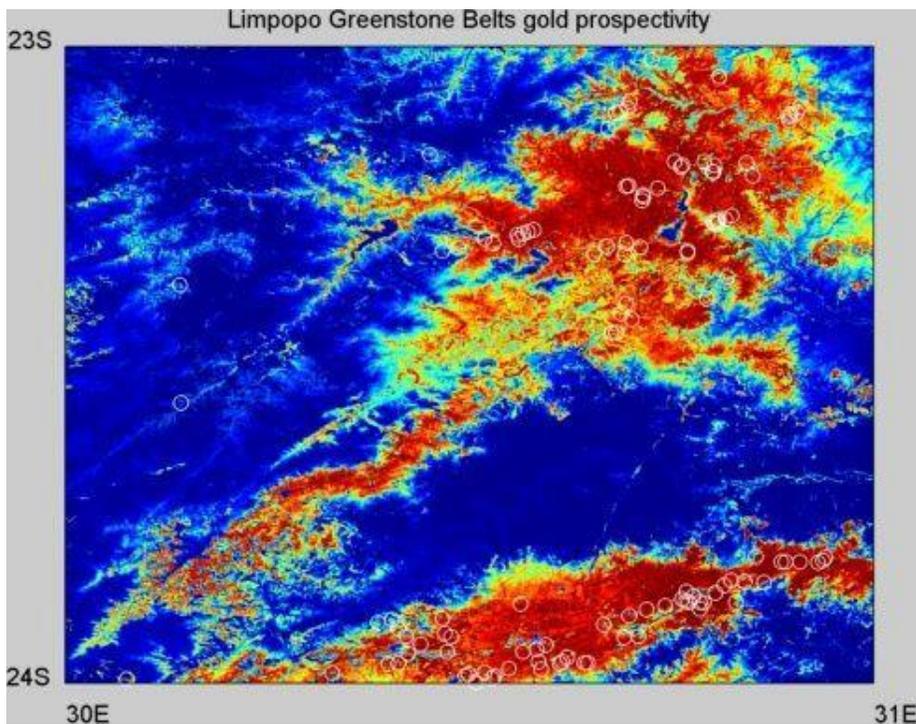
Terracore

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Remote sensing of the earth has matured to such an extent that many images useful for mineral exploration on a regional scale are available for free (Landsat 8, Sentinel-2) or almost nothing (Aster, ALOS). Parameters sensed include reflected UV, VNIR, SWIR and long wavelength IR, radar, DTM (from stereo pairs or radar) and even gravity from the GOES and GOCE satellite missions.

Access to inexpensive satellite regional datasets is a boon to emerging economies and the artisanal mining industry and goes a long way to leveling the playing fields with multinational miners.

We present a supervised classification of imagery of the Limpopo Province, South Africa, trained on a database of 121 gold occurrences on the Murchison and Giyani Greenstone Belts supplied by the Council for Geosciences. Our regional data include two 100m spatial resolution daytime thermal channels from Landsat 8, a 30m DTM obtained from Aster stereo pairs and a satellite gravity anomaly image at 220m spatial resolution. All images “see through” the savannah vegetation which bedevils VNIR and SWIR systems in these terrains.



In a novel implementation of random forest classifiers, we use support vector machines [2] from machine vision to simulate 100 gold classification maps. We combine these simulations into a single prospectivity map using principal components analysis. The map (above) is temperature coloured with red most prospective and blue least and the open white circles, known gold deposits.

### References:

[1]: Hirt, C, S.J. Claessens, T. Fecher, M. Kuhn, R. Pail, M. Rexer (2013), New ultra-high resolution picture of

Earth's gravity field, Geophysical Research Letters, Vol 40.

[2] Cortes, C.; Vapnik, V. (1995). "Support-vector networks". Machine Learning 20 (3): 273.

