Decorrugating magnetic maps

Corrugation is typical in ground (and airborne) magnetic surveys where observations are acquired at relatively high spatial frequency along more widely spaced transects. In ground applications, despite the usual efforts to keep the sensor a constant distance from the ground, bunch grass, rough surfaces, rocks and wind combine to interfere with the operator and impact the distance of the sensor from the ground while walking and acquiring observations at 5-10 Hz. This manifests as linear magnetic anomalies in the direction of acquisition. Urquhart (1988) developed the standard technique for decorrugation filtering. Fedi and Florio (2003) and Tsivouraki and Tsoka (2007) both provide alternative methods using the wavelet transform. Regardless of the algorithm, decorrugating a magnetic map yields a better estimate of anomalies due to other causative sources of greater interest.

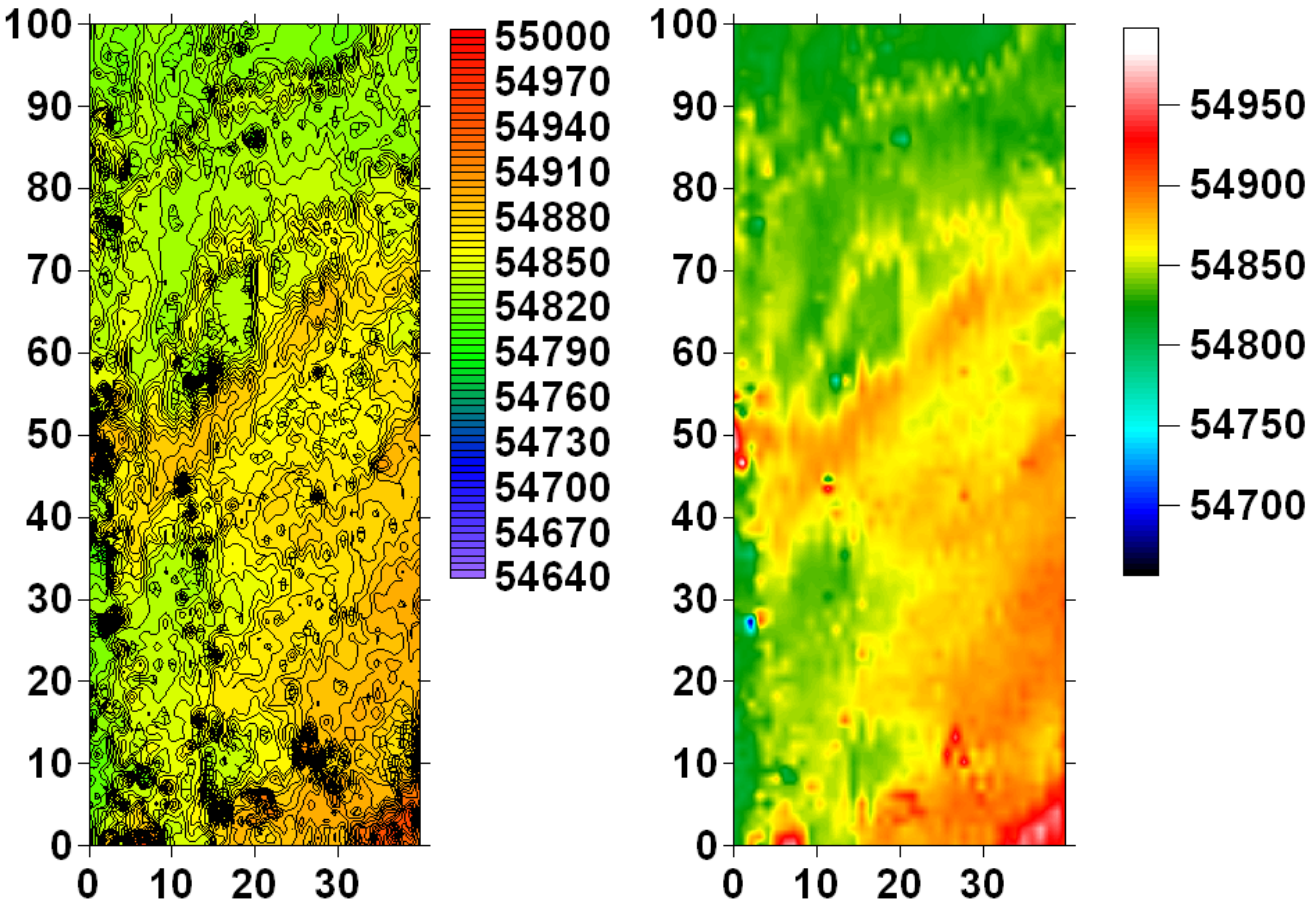

Figure 1. Total field intensity magnetic data collected on the ground at 5 Hz with Geometrics Cesium vapor magnetometer before decorrugation. Spatial dimensions are meters, contours at 5 nT. The long axis of the maps strikes 130^{o} east of north.

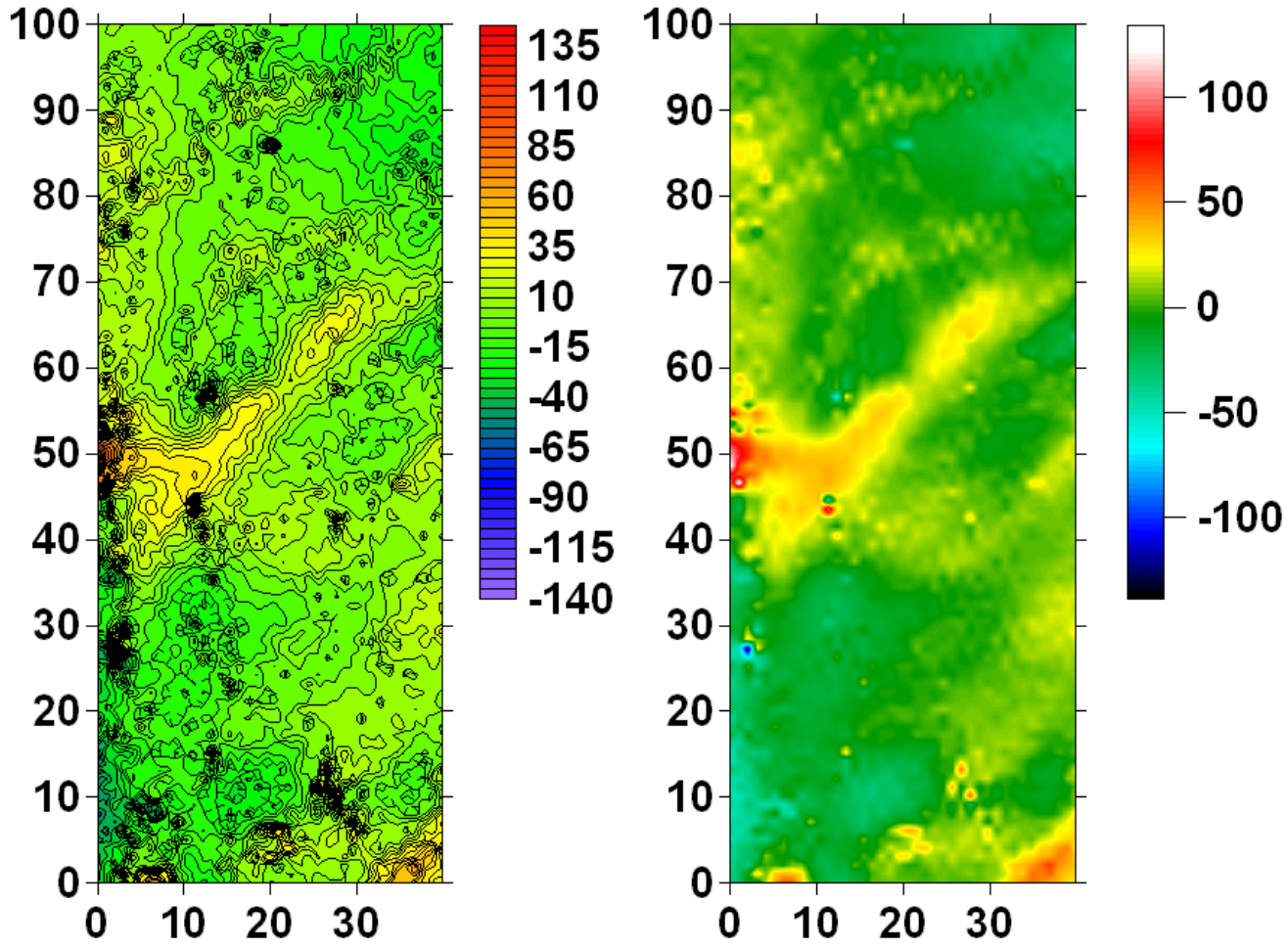

Figure 2. Magnetic maps after removing a slightly dipping regional plane and decorrugating (Urquhart (1988) with a 9x9 filter.

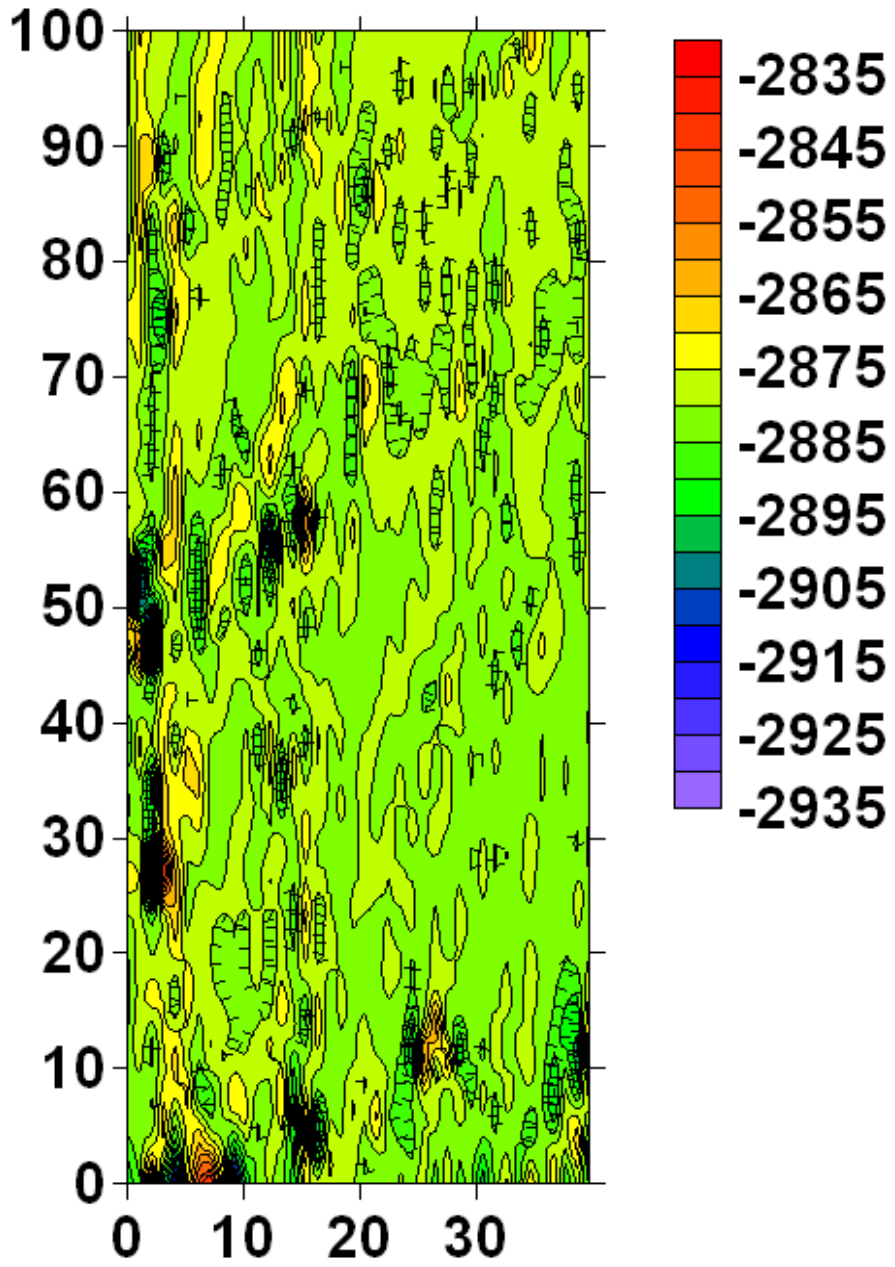

Figure 3. The corrugation noise removed from Figure 1 to produce Figure 2. Contours are 5 nT.

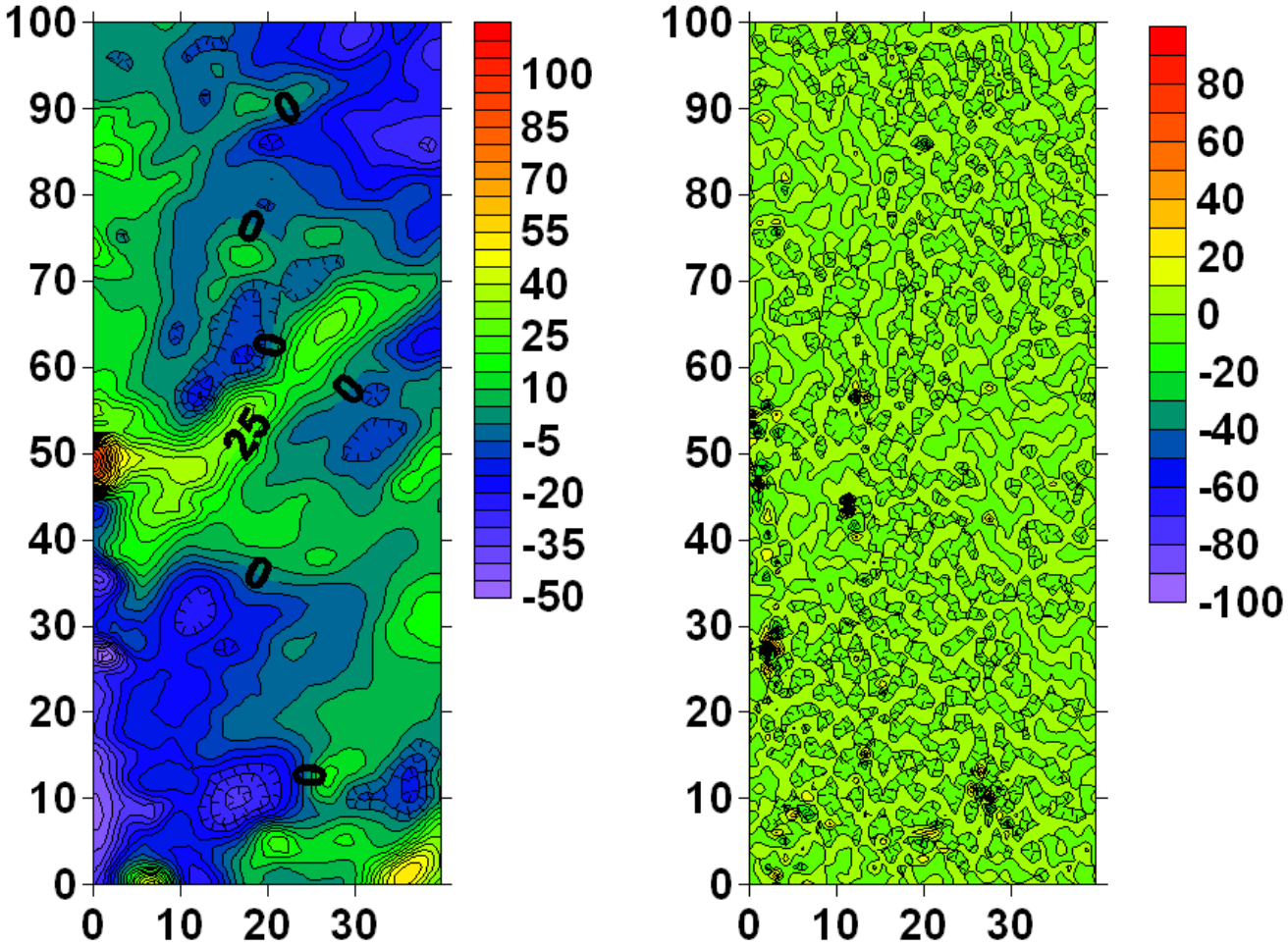

Figure 4. The final residual map (left) and surface dipoles (right) are separated by matched filtering. The residual is free of corrugation and surface noise caused by ferromagnetic debris on the ground surface.

Figure 5. The power spectrum of the decorrugated TMI map clearly shows two linear segments that represent the two components separated by matched filtering (Figure 4).