THE TRUE STRUCTURE OF WEAK SOLAR MAGNETIC FIELDS

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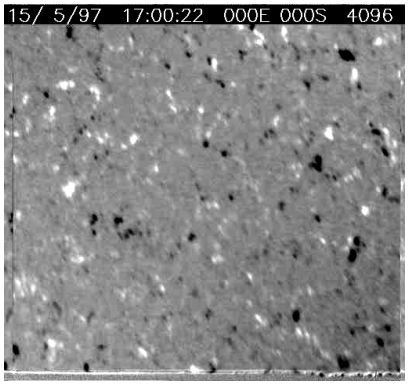
A 2-DIMENSIONAL MAGNETOGRAM

The videomagnetogram (VMG) at right shows the distribution of flux obtained by differencing the Φ1 and Φ2 Zeeman components. The spectro-VMG (SPVMG) does the same, except it operates on the spectrum. It is claimed the real fields are invisible dots of strong field, the measured field strength due to a filling factor. Why, then, don't we resolve the larger elements?



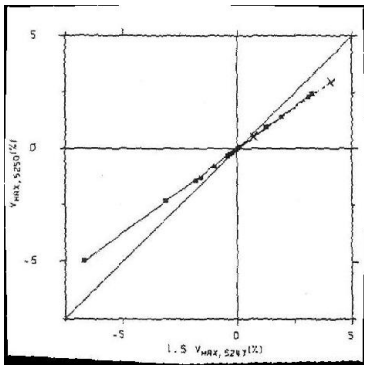
2

THE 5250 (G=3) TO 5247 RATIO

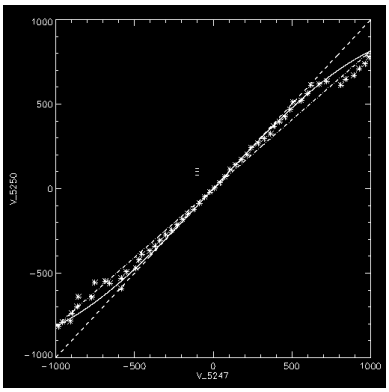
Stenflo pointed out that the true field strength could be deduced from the 5250/5247 ratio, which should be 1.5, but deviates as 5250 saturates first. At left, the 45 deg slope indicates no saturation, and Stenflo's kilogauss fields rated, producing a tilted line. In the right hand plot, the 45 deg cates no saturation, the curved line, a filling factor one and the e, the kilogauss model. Our data shows filling factor one.

STENFLO

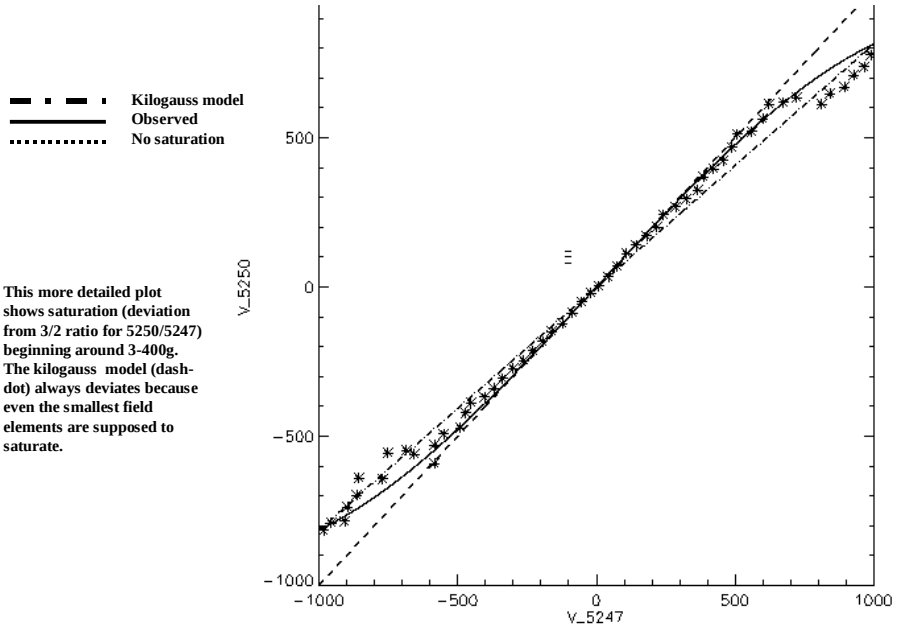
US



V 5 2 5 0



1.5V 5247



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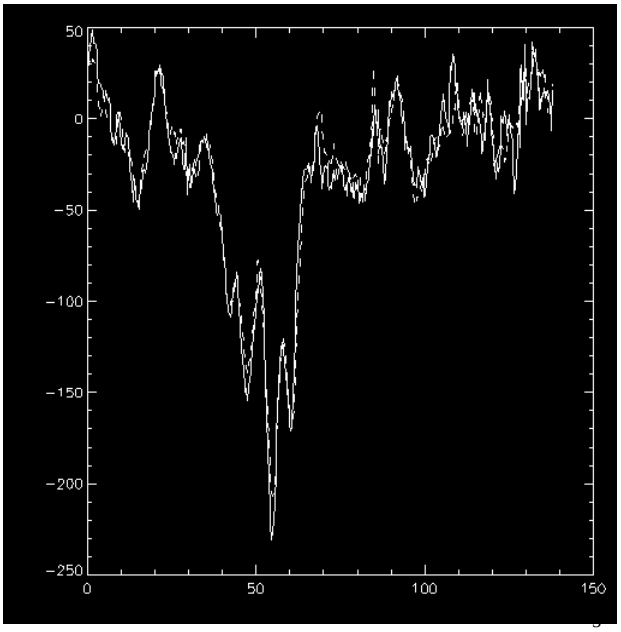
This plot scans the spectrum below along the slit, calculating The integral of V in 5247 and 5250 (dashed). The 5247 signal is multiplied by 3/2 to allow for the g-factor. The results track perfectly. THERE IS NO WAY THE MEASUREMENT CAN GUESS THE G-FACTORS, AND THE ERROR CAN BE JUDGED BY THE DEVIATION BETWEEN THE TWO CURVES.

This test is not possible for the kilogauss model, which depends on disagreement of the two measurements. This result shows that there are no kilogauss fields in the quiet Sun.

The strong (250 gauss) fields are in a network element.



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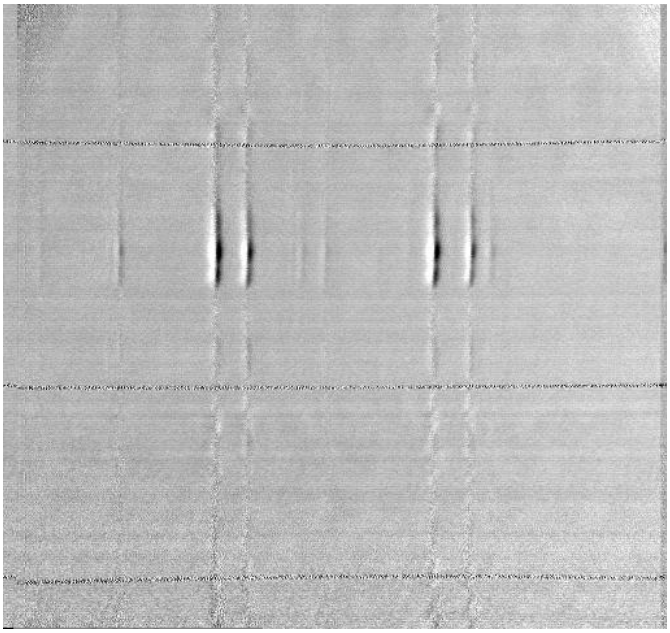
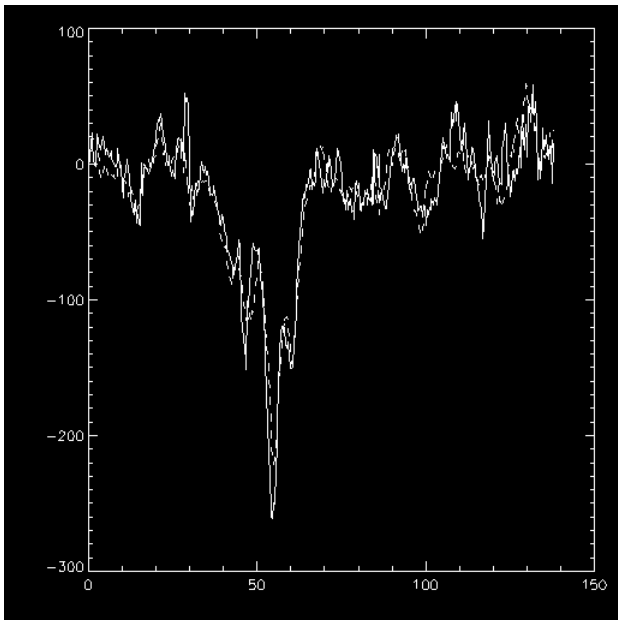
HIGH-SENSITIVITY SPVMG-GRAM

Previous direct spectra Measured only peaks in the spectrum. We see here there are weak fields everywhere along the slit. The V signal of these gives the proper 3/2 ratio for 5250 (2d left) and 5247 (far right), showing that the measurements are accurate.



This scan measures the more conventional V signal obtained by measuring just two spectral bands. It is noisier than the M plot, but the two lines track just as well.



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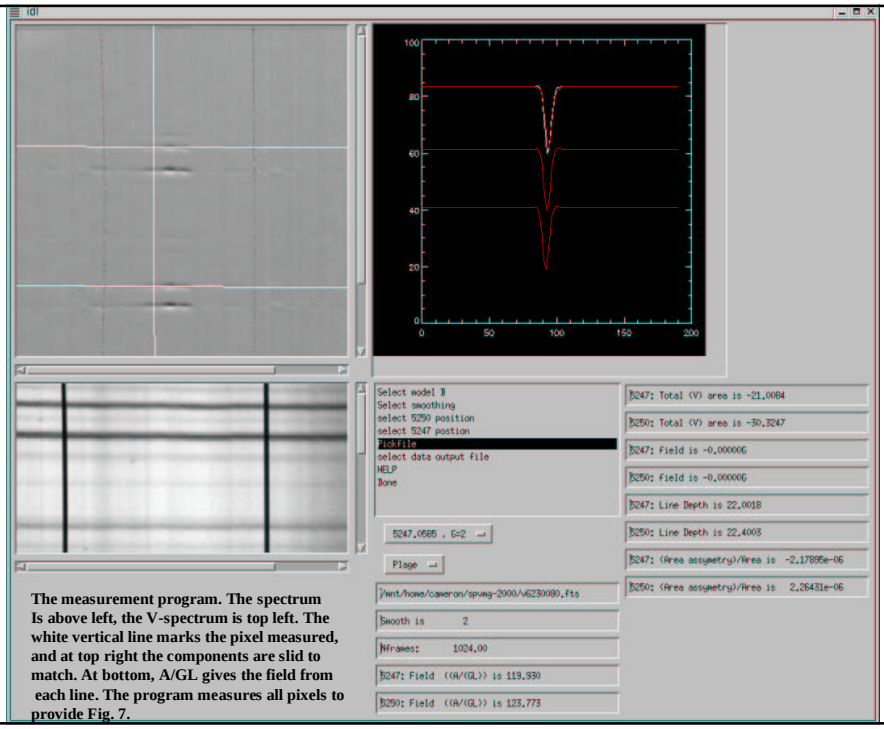
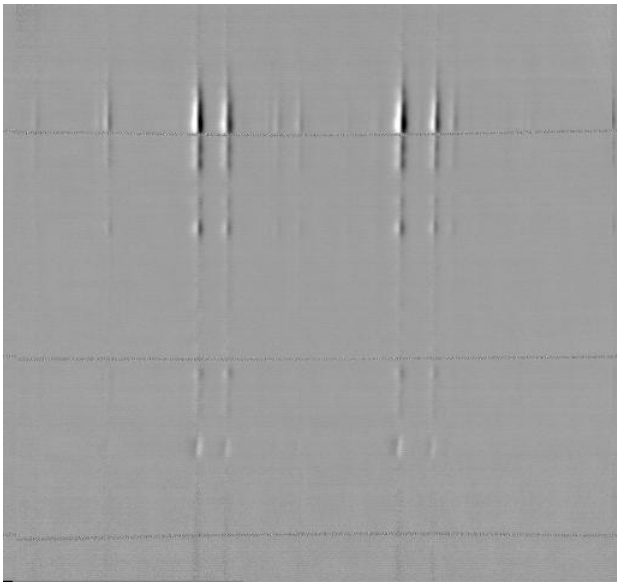


The measurement program. The spectrum Is above left, the V-spectrum is top left. The white vertical line marks the pixel measured, and at top right the components are slid to match. At bottom, A/GL gives the field from each line. The program measures all pixels to provide Fig. 7.

A V-spectrum of a stronger element, which the scan following shows to be kilo-Gauss. This is a short scan, so the weaker fields are hard to see. No other kilogauss fields appear.



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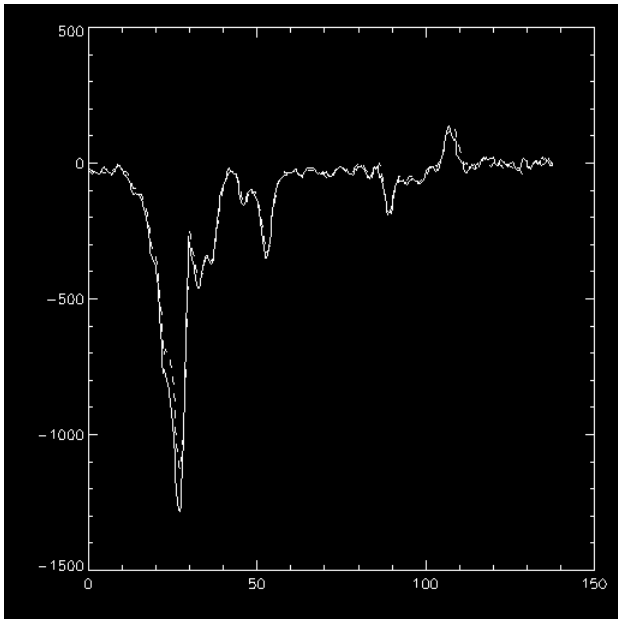
Scan along slit. Note some saturation of 5250 (dashes) for the kilogauss field. This shows how failure to detect weak fields leads to a model without weak fields



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True field can be measured in only a few ways: by splitting or by profile.

Splitting can be measured at 12 μ. Measurements by Brault and Noyes and Zirin and Popp show no splitting greater than 250 gauss. This was immediately explained away as due to the higher source level of 12μ source . But the Zirin-Popp measures show no decrease in field strength near the limb, as would be expected if field decreased with height. Further, TRACE images do not show the field lines spreading.

Splitting can also be measured in IR, but data are noisy and splitting is not detected for weaker elements. However all direct splitting measures give fields below 500 gauss, and do not measure the weaker elements which cover the surface. The indirect measures yield kilogauss fields in a 4x4 arc sec box, requiring a 1/10,000 accuracy to obtain the claimed result.

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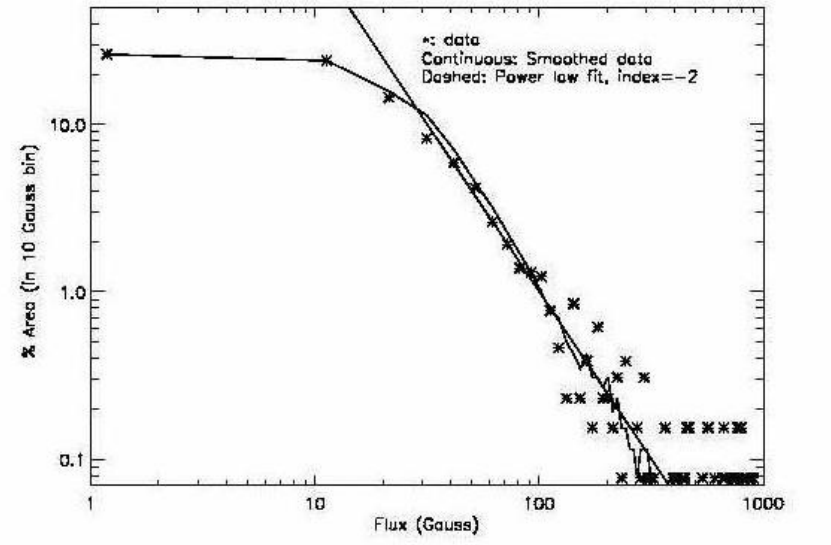
Distribution of field strengths



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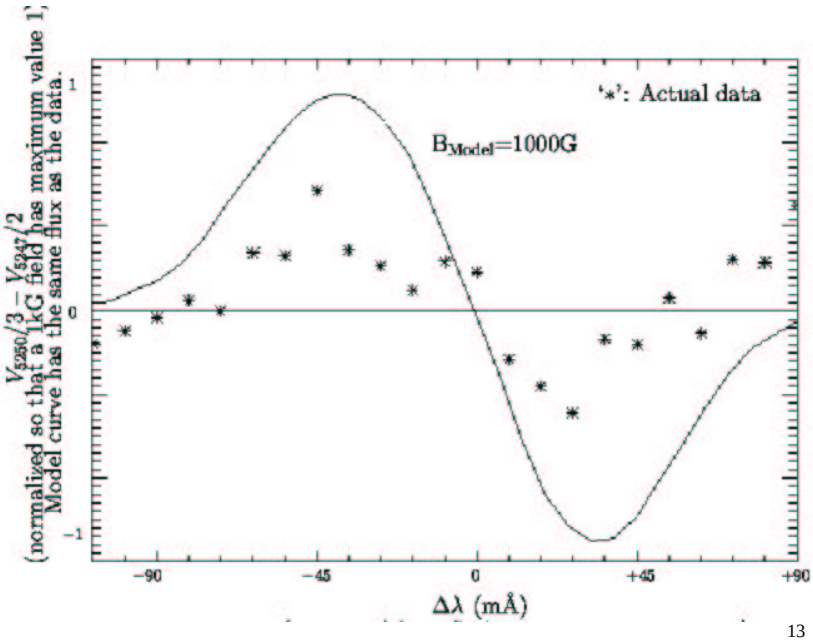

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Sunspot fields

Data on small sunspots and strong fields. Note the anomalous patterns, which are a mystery, probably due to overlying fields. The anomalous Zeeman patterns appear in the penumbra.

This shows the huge difference between real Kilogauss fields and purported.

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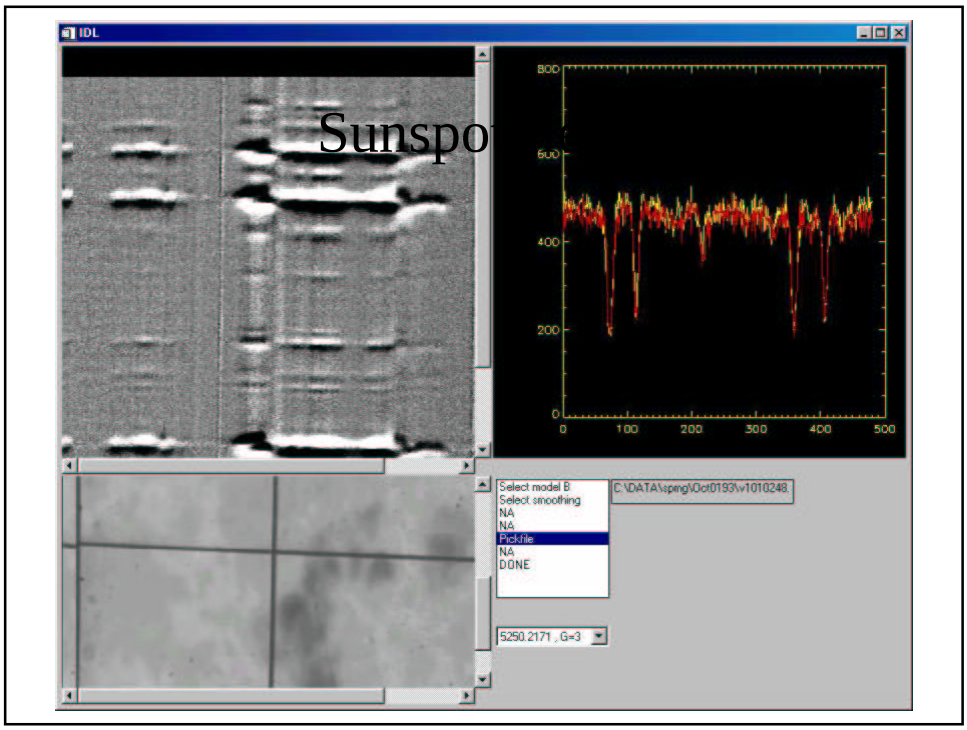
IDL
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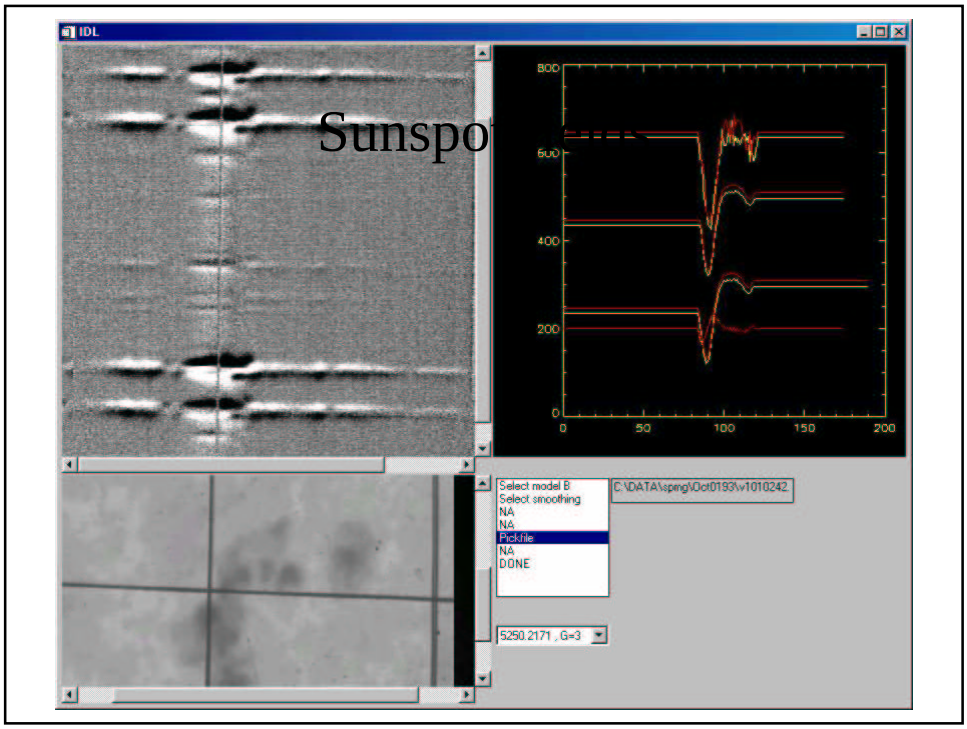
5250.2171 , G=3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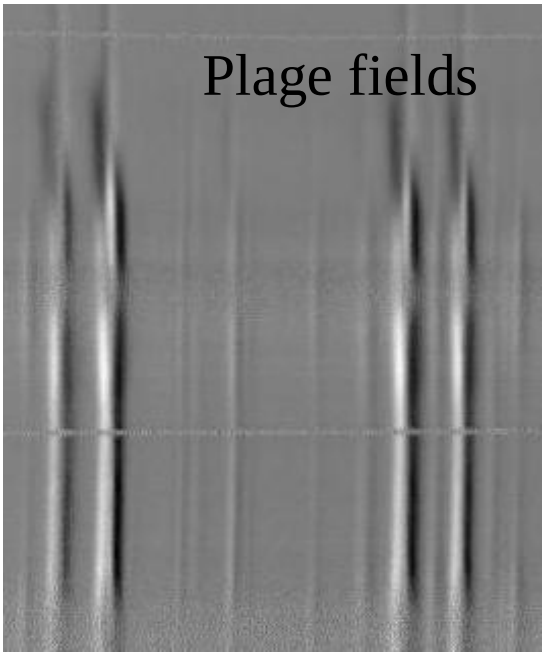
Plage fields



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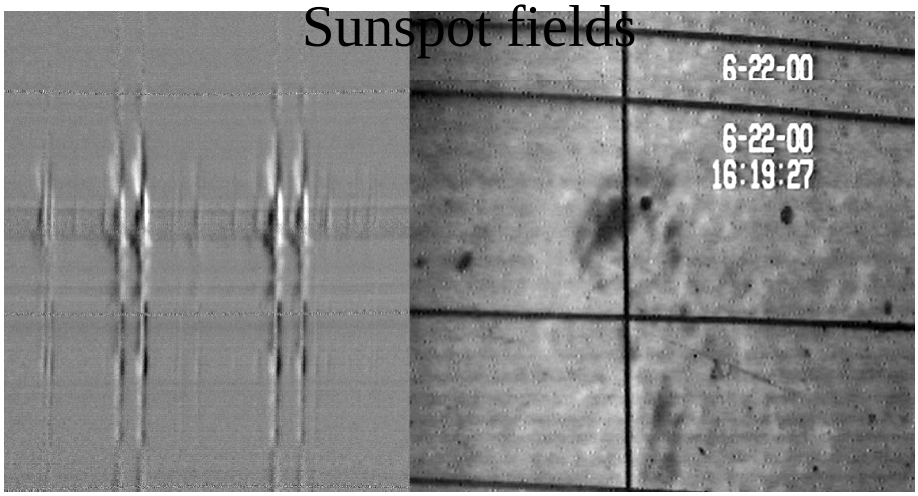
Sunspot fields



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