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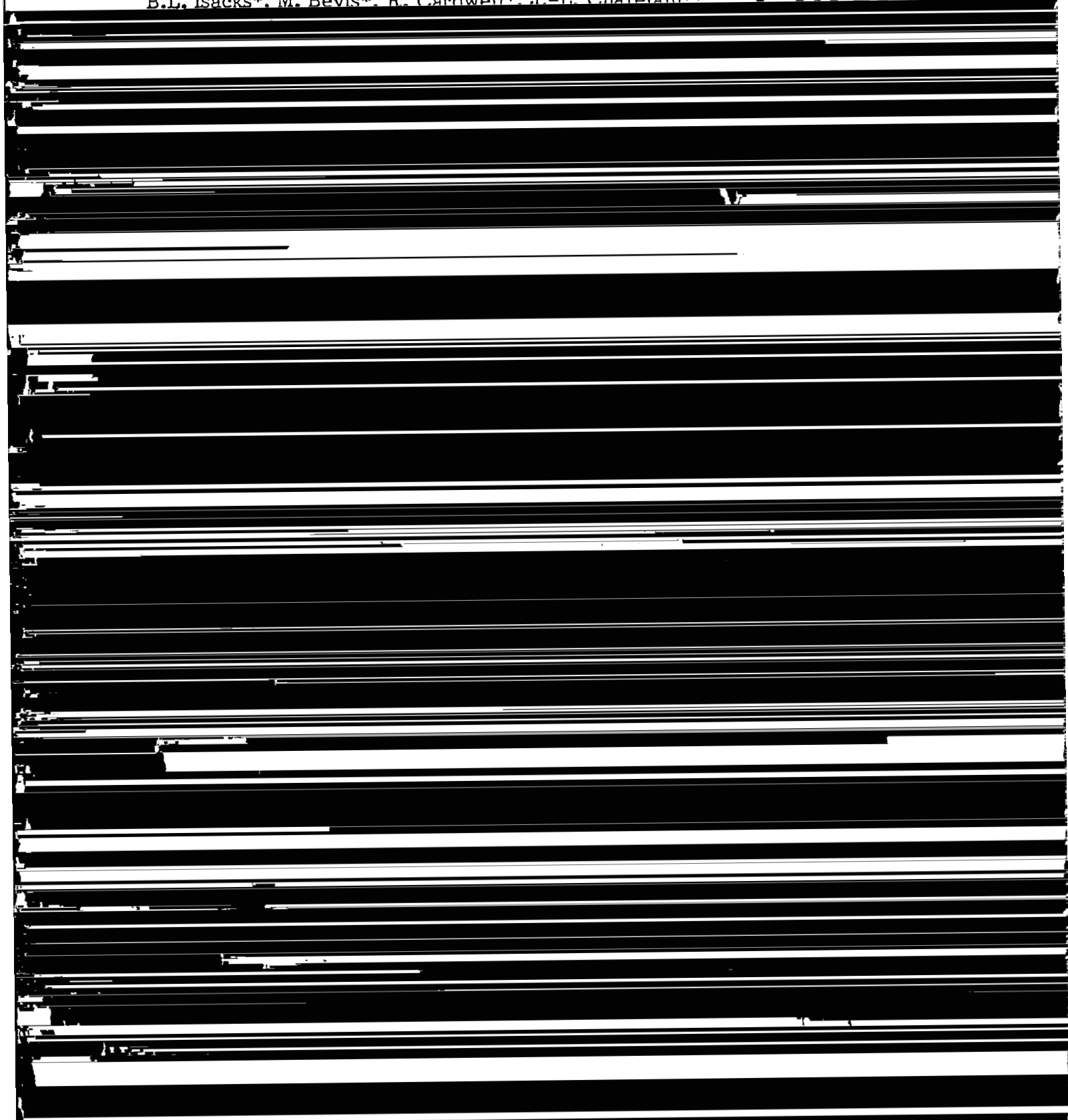
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MONITORING SEISMICITY AND SURFACE DEFORMATIONS
 IN THE NEW HEBRIDES ISLAND ARC

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That topographic feature also has clear expressions in the focal mechanisms and space-time pattern of occurrence of intermediate depth earthquakes, and in the pattern of uplift and tilting of blocks in the upper plate on Santo and Malekula islands.

The southern "unruptured" area includes the transition between the anomalous morphology of the central New Hebrides and the more typical island arc-trench system of the southern New Hebrides. Major transverse bathymetric features are associated with the northward termination of the trench between Efate and Malekula Islands. This region is the locus of several striking features of the seismicity. A remarkably high and nearly constant rate of seismicity (mb greater than about 4.5) has persisted there during the past 20 years. This contrasts with the generally lower rate in the north and in several other parts of the arc where strong fluctuations in activity are related to the occurrence of large earthquakes. Focal mechanism solutions and accurate depths for the larger events of 1963-1978, in combination with data from local networks, delineate the inclined plate boundary beneath Santo. In contrast most of the data for the Efate region indicate a more diffuse distribution of seismicity with significant activity in the upper plate. The largest earthquakes caught so far in our program occurred in a sequence of 4 events ($M_s = 5.9 - 6.2$) in the Efate area between September 1978 and September 1979. The largest of the four was preceded by a foreshock sequence, but the others were not. Well-defined features of the time-space development of foreshocks, aftershocks and related swarms in the sequence, together with aspects of previous seismicity, indicate a persistent and localized structural feature in the transition region north of Efate which plays an important role in the pattern of seismicity.

Tilts on Efate and Santo Islands are reliably determined during the past 5 years by 12 relevellings each of 1 km arrays of benchmarks. The Efate measurements show a large consistent tilting of 5-6 microradians upwards towards the anomalous area north of Efate. Much of this tilting seems to have taken place during a 1.5 year interval prior to the 1978-79 sequence. In contrast, the Santo measurements show little accumulated tilt, although a 3-4 microradian pulse-like signal can be tentatively correlated with the Efate signal.

Thus, although the various data for the Efate area may be interpreted as precursory or pre-seismic phenomena - e.g. increased loading of a locked fault zone - there is also the possibility that the mode of plate boundary slippage is governed by specific morphological and structural features and may vary significantly along the arc. Even if the fraction of seismic relative to aseismic slip is