CHAPTER VIII

CONCLUSION

A half-space problem in potential theory is treated as a particular case of a closed domain problem with a part of the boundary at infinity. Derivation of a half-space problem by Green's formula is straightforward. For a closed domain problem expressed in simple or double layer boundary density, consideration of the order of the density at infinity leads to its conversion to a half-space problem.

On up-continuation of a two dimensional harmonic function $H$, an anomalous gravity field or a component magnetic field with asymptotic behaviour $H = O(r^{-n}), n \geq 1, r \to \infty$, from boundary data, it is shown that for the data specified over a half-space boundary, the field in the upper half-space domain $B$, can be reproduced as potential of a simple as well as a double layer boundary density. It is also shown that the field can be reproduced in $B$, by Green's formula without finding Green's function for the boundary.

In down continuation of a two-dimensional potential field from a finite datum line it is shown that down-continuation to a curved boundary with a flat central part, its arms coinciding with the datum line, provides a better numerical result over the flat central part than that provided over the same flat part by down-continuation to a horizontal boundary coinciding with it. The technique so developed helps in providing a better coverage in down-continuation of aeromagnetic data acquired over a narrow valley bounded by steeply rising high granitic hills at its boundary.
On depth-determination by down-continuation of a 2-D potential field towards its source, it is expected that down-continuation to a concave boundary with its arms extending along the datum line and the apex moving downward in steps along a vertical giving the boundary a tapering shape as depth increases, will lead to determination of point to point depth to an undulated basement in a geological basin when continuation to a horizontal boundary theoretically fails to achieve it.

An analysis is carried out to determine the spacing of data over the datum line for achieving a reliable continued field upto a depth $D$, along a vertical. It is shown that the data-spacing $h = D/4$ provides a reliable continued field at the apex of the concave boundary as it moves downward along the vertical. Further, in down-continuation of data from a finite datum line, it is shown that the error in the continued field computed along the vertical steadily increases with depth. As such, this does not affect the position of the first maximum of the vertical gradient of the field along the vertical, the depth of the first maximum of the vertical gradient defining the depth to the top of the subsurface causative mass.

In application to field data, isolation of a magnetic anomaly is not required for determination of depth to the basement from it. The data read from a map or profile data prepared with normal correction acquired along a line, can be treated as isolated for its use in depth determination.

On successful testing of the techniques on model data, these are applied to aeromagnetic data of Umium valley of Shillong-Nongpoh area, bounded at south by a steeply rising hill of Meghalaya. The analysis identifies EW trending basement faults un-identified in the exposed geology of the area and predicts existence of 2 to 2.5 thick sedimentary cover, possibly non-magnetic in nature.