about m5.4 . This, of course, is using one of the most sensitive LPZ systems being considered in this study. It can be estimated from the above data that the 4-station matched filtering threshold, restricted to stations capable of matched filtering, is about m5.6 at the northern hemisphere specific sites.

The possible improvement using R_g and purely continental paths has been demonstrated only for NTS explosions using Canadian and United States stations* (Basham, 1969a; Evernden, 1970c). In this case the available stations are those confined to the same continental mass as the events of interest and thus there is the benefit of shorter propagation paths (maximum Δ about 40°) as well as the smaller R_g wave attenuation with distance (see Basham, 1970). An estimate of the empirical 4-station threshold of explosion R_g detection, and therefore of explosion identification, is about m5.0 using Canadian stations in the distance range 13° to 40°, and about m4.7 using United States stations as near as about 3°. Thus, the use of lower sensitivity conventional stations and taking advantage of shorter paths with purely continental propagation yields an explosion identification threshold lower than that of the most sensitive LPZ systems applying matched filtering to more distant events.

A short diversion to a discussion of some recently determined explosion yield versus Rayleigh wave magnitude relationships will clearly illustrate the proven and potential advantages of using the shorter period continental Rayleigh waves. Until recently the equivalent hardrock yield of an underground explosion has been defined only on the basis of empirically determined, but theoretically supported, relationships between yield and P wave magnitude (the relationships we are applying are shown in Table 8). Evernden and Filson (1970), observing a similar non-linearity in m versus log-yield and M versus m , derived a new relationship between M and log-yield which has the form

$$M = 1.4 + 1.3 \log Y \quad , \tag{8}$$

where M is determined from 20-second Rayleigh waves and Y is the yield in kilotons. This linear relationship accurately represents the available yield data between yields of about 6 and 1000 kilotons, M2.5 to M5.5 . Evernden and Filson also show for explosions that M_{R_g} determined from the 8 to 14 second (R_g) Rayleigh waves is equivalent to M + 1.1 ; this is in close agreement with the difference derived by Basham (1969b). Thus, we have

$$M_{R_g} = 2.5 + 1.3 \log Y \quad . \tag{9}$$

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* All Canadian stations used by Basham (1969a) are shown in Figure 6, but only four are included in the 51-station LPZ network; Evernden (1970c) used moderate magnification Long Range Seismic Measurement stations, none of which are included in the United States UN Return; however, the abundance of United States conventional stations shown in Figure 6 would have an equivalent capability.