

EARTHQUAKE WAVE VELOCITIES
AND TRAVEL TIMES, AND CRUSTAL
STRUCTURE SOUTH OF ST. LOUIS.

by

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Introduction

With the founding of the Geophysics Department at St. Louis University in 1925 under the direction of Rev. James B. Macelwane, S.J., a plan was evolved whereby the seismicity of the region was to be studied. A network of stations was planned which would supply the instrumental data for the intended study. This network today is comprised of four stations which make up the St. Louis group. They are the St. Louis station proper, the Florissant station, the Little Rock station and the Cape Girardeau station.

This last station, Cape Girardeau, is the newest of the group, having been inaugurated in 1938.

It has been the author's purpose to study all available and pertinent material from these stations in the hope of determining the crustal structure and the wave velocities peculiar to this structure for the area south of St. Louis. All data included herein have been restricted to a southern azimuth. The author has reason to believe that the crustal picture varies with its azimuth from St. Louis. The reason for this belief is twofold. A comparative examination of an earthquake record with an eastern azimuth from St. Louis such as the

Anna, Ohio quakes and an earthquake with a southern azimuth, such as the Arkansas Earthquake of September 17, 1938¹ which was studied by the author, reveals immediately a striking difference in the character of the record. From a geologic viewpoint as one goes east from St. Louis he passes through the Illinois Basin, as one goes south from St. Louis he passes into the Ozark Uplift. Here we have two distinct and different geologic structures, one a synclinal trough and the other an uplift. It is quite possible therefore that the crustal structure underlying these two different geologic features is also quite distinct and different. For the reasons given above it has been considered prudent to restrict this study to a given azimuth, and that a southerly azimuth.

Up till the present time Fr. Joliat's² tables for near earthquakes have been used as a first approximation in dealing with local shocks near St. Louis. These tables are based on a hypothetical structure consisting of a 10 km layer, at the base of which the earthquake occurs, underlain by a 20 km layer above the Mohorovicic discontinuity. Jeffries' velocities are postulated for the various layers that is:

Pn	7.8 km/sec	Sn	4.35 km/sec
P*	6.3 km/sec	S*	3.7 km/sec
Pg	5.4 km/sec	Sg	3.3 km/sec

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1. Walter, E.J., "The Arkansas Earthquake of Sept. 17, 1938", Bulletin of the Seismological Society of America, Vol. 29, 1939, pp. 497-503.
 2. Joliat, J.S., S.J., "Tentative Tables of Travel Times for Near Earthquakes", published in mimeographed form by St. Louis University, St. Louis, Missouri, 1934.

Although these tables do not present a true picture they have been most useful in dealing with shocks in this region. Good agreement has been obtained between the macroseismic evidence and the instrumental analysis based on these tables.