INTRODUCTION

Discoveries of silicate-metal worlds around other stars have inspired diverse geophysical models of their plausible structures and tectonic regimes [1]. These models are severely hampered, however, by inexact assumptions about long-lived radioactive heat production \(10^{13} \text{Pu}, 10^{17} \text{U}_{238}, \text{Th}_{232}\) and inventories of rock-forming elements [e.g., Si, Al, Fe, Ca, Na, Mg].

Host stars of planets ought to broadly reflect the overall compositions of planetary systems [2,3]. Figure 1: d) suggests, the correlation between stellar abundances and planets is the presence of Jupiter-mass worlds around stars enriched in Fe/H content [e.g., 4]. Otherwise, stellar metallicity is a poor predictor of the likelihood of hosting planets. The spread indicates a variety in density. Here, the very large uncertainties for radius and mass are omitted. Simple interior structure estimates are also shown by colored lines. The intensity in color of the dots indicates the metallicity ([Fe/H] ratio) of the host star as shown in the legend bar at right. (Data source: www.exoplanet.eu) [see ref. 3].

To better understand the geodynamical nature of exoplanets to make predictions about observations of such phenomena, we discuss the consequences of this discovery on geodynamical regimes. The geodynamical consequences of these differences are discussed in the following sections.

Here, I show how Galactic Chemical Evolution (GCE) models of star (and planet) age and composition yield different effects on geodynamical regimes. The geodynamical consequences of these differences are discussed in the following sections.

INTRODUCTION TO EXOPLANETARY MANTLES

Recent [8-10] GCE codes (1) improve models for the evolution of radiogenic heating in rocky exoplanets and (2) assess the geophysical effects of different rock-forming element inventories [e.g., Mg/Si]. Figure 2) emphasizing factors that affect geodynamic regimes (e.g. mantle properties, heat production, crust type).

Here, I show how Galactic Chemical Evolution (GCE) models of star (and planet) age and composition yield different effects on geodynamical regimes. The geodynamical consequences of these differences are discussed in the following sections.

Figure 1. The similarity of meteoritic and photospheric abundances is evident in this figure for our solar values vs. terrestrial compositions. Abundances have been normalized to 10\(^{13}\) atoms of Si. Points along the diagonal have near-identical abundances in both meteoritic and photospheric data sets. Elemental abundances above the diagonal are depleted in CI chondrites (N, C, O, H and noble gases). Elemental abundances below the diagonal are depleted in the Sun (Si). [from ref. 3].

Figures are not provided in the text. Please refer to the original document for visual representations of the data.

REFERENCES