How did our Solar System Establish

Its Normal Isotopic Composition

Typhoon Lee
Inst. Earth Science, Academia Sinica

Preliminary study of the dust grains returned by the STARDUST spacecraft from comet Wild-2 (Brownlee et al, Science, 314, 1711, 2006) showed that the dust in that comet overwhelmingly has normal solar system isotopic composition.. In addition most of the dust consists of phases with melting temperature far higher than the frigid temperature this comet has remained at since its formation. There was even a micro-CAI found whose composition is identical to the CAI in meteorite. These results suggest that in the early solar system pre-solar dusts were initially mixed and homogenized in a high temperature environment near the proto-sun. Since the mixing is over large number of grains they all average to establish the normal isotopic composition. Afterwards they were transported to outer solar system beyond Neptune where comets formed. Over ten years ago, Shu, Shang, and Lee (Science, 271,1545, 1996) applied their x-wind model developed to explain the bi-polar outflow in currently forming proto-stars to the early solar system. They predicted the presence of CAI with solar system composition in comets. I will review how the X-wind can explain the existence of the normal isotopic composition. The challenge now is whether the x-wind can explain the decreasing isotopic heterogeneities for solids of increasing sizes from microscopic mineral, via CAIs, to planetary bodies.

.

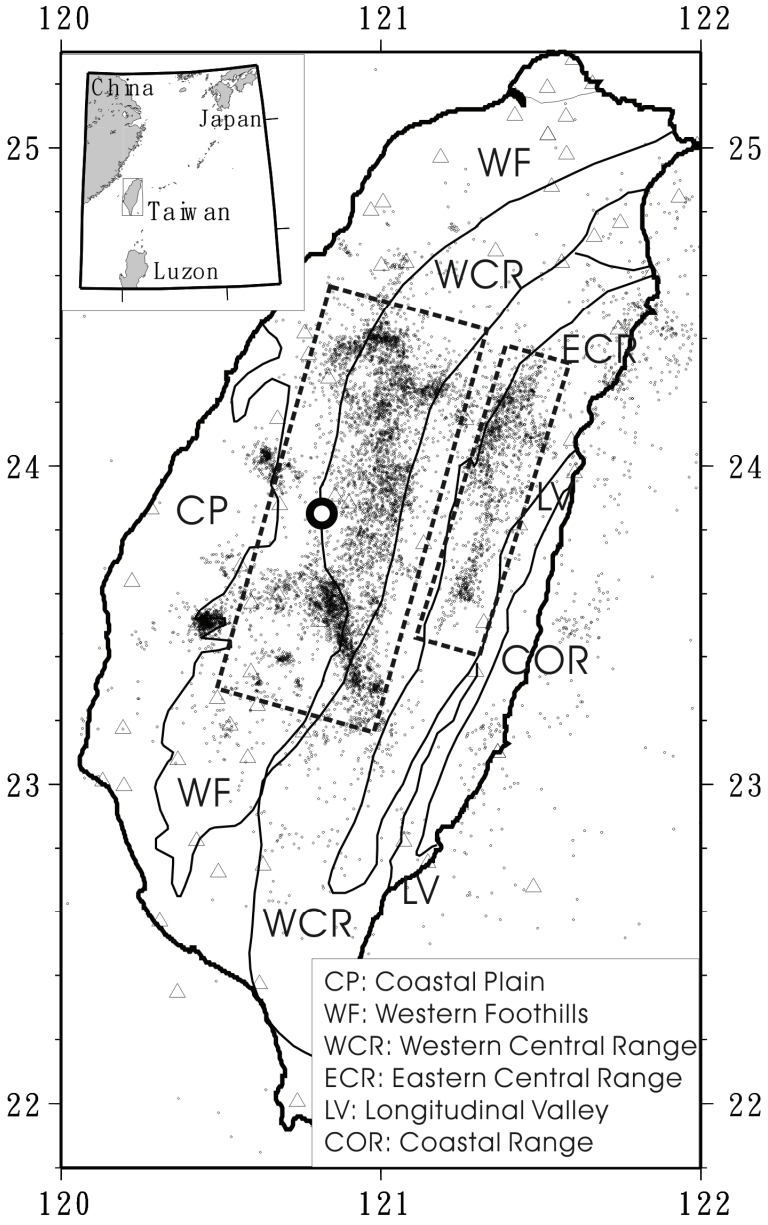

Figure 1. Distribution of earthquakes (small dots) after the 1999 Chi-Chi, Taiwan earthquake (a thick circle) and the general geology of the island of Taiwan. Most earthquakes are grouped into two seismic zones (i.e., the Chi-Chi and the Central Range seismic zones) marked by dashed-boxes. The regional seismic network (CWBSN) was marked by triangles.

註解 [l1]: 12 Times New Roman