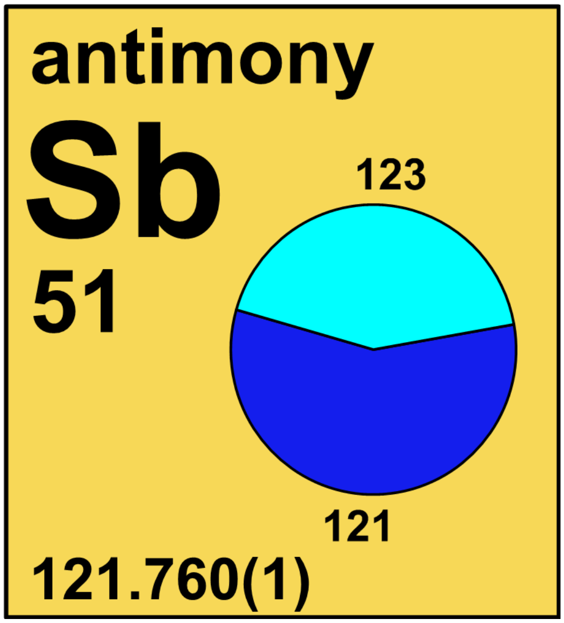
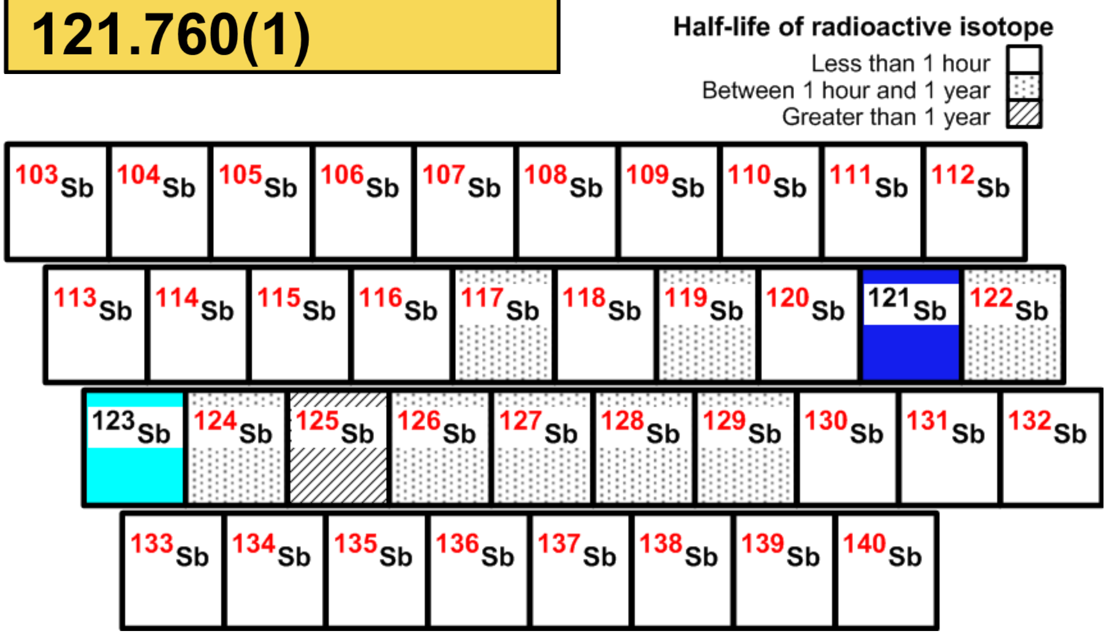
4.51 antimony



Stable isotope	Relative atomic mass	Mole fraction
^{121}Sb	120.903 81	0.5721
^{123}Sb	122.904 21	0.4279



4.51.1 Antimony isotopes in Earth/planetary science

Molecules, atoms, and ions of the **stable isotopes** of antimony possess slightly different physical and chemical properties, and they commonly will be fractionated during physical, chemical, and biological processes, giving rise to variations in **isotopic abundances** and in **atomic weights**. There are measureable substantial variations in the isotopic abundances of antimony in natural terrestrial materials (Figure 4.51.1) [367]. The stable isotopes ^{121}Sb and ^{123}Sb have been used to measure movement of sediments and rocks originating from locations high in antimony. ^{121}Sb and ^{123}Sb move with the sediments and have been used as **tracers** in areas low in antimony to determine the originating location of certain metal/metalloid contaminants in streams [368-370].

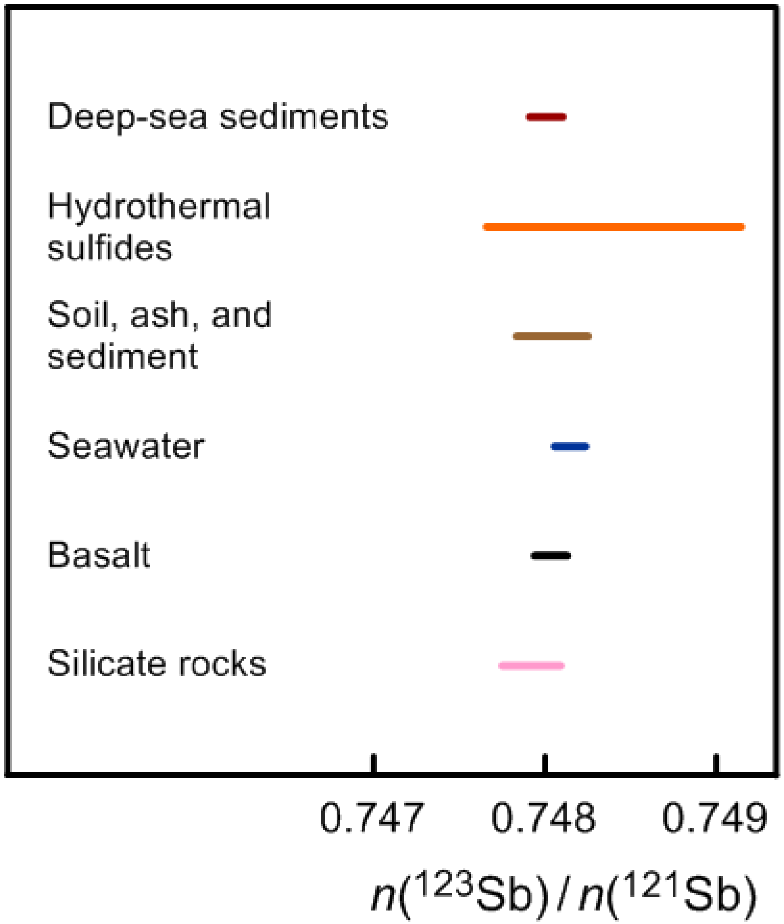


Fig. 4.51.1: Variation in **isotope-amount ratio** $n(^{123}\mathrm{Sb})/n(^{121}\mathrm{Sb})$ of antimony in terrestrial materials (modified from [367], assuming a measured isotope-amount ratio $n(^{123}\mathrm{Sb})/n(^{121}\mathrm{Sb})$ of 0.747 85 [371].

4.51.2 Antimony isotopes in industry

In the 1950s, ^{124}Sb and ^{125}Sb (with **half-lives** of 60 days and about 1000 days) were used commercially as tracers. They were injected into oil pipelines as a way to detect the **residence time** and flow rate of the substance through the pipeline. The presence of these **isotopes** could be detected by means of a **Geiger counter** held above the pipeline. If the pipeline had a leak, the tracer would escape and its contamination and movement could be detected in the soil. ^{124}Sb and ^{125}Sb are now both treated as environmental contaminants [372].

4.51.3 Antimony isotopes used as a source of radioactive isotope(s)

^{123}Sb is used to produce ^{124}I (with a half-life of 100 hours), which is used in **radioimmunotherapy** and also in **positron emission tomography**. It can be produced from the ^{123}Sb (^{3}He, 2n) ^{124}I reaction [373]. ^{121}Sb and ^{123}Sb can both be used for the production of ^{123}I (with a half-life of 13.2 hours) via ^{3}He and **alpha particle**-induced reactions with ^{121}Sb and ^{123}Sb, although the most common production route is via ^{124}Xe or ^{123}Te [374].