

Concept of frame of reference

DEFINITION

Any description of motion must be made in relation to a reference solid.

A frame of reference consists of:

- a reference solid in relation to which the positions of the system are marked.
- a clock to mark the dates.

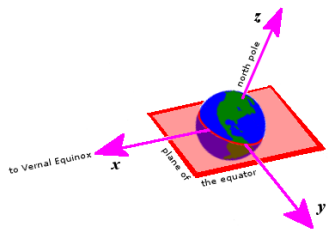
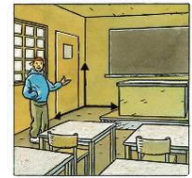
This gives a precise description of the movement.

COMMON FRAMES OF REFERENCE

Terrestrial frame of reference.

- origin at any point on any object linked to the Earth.
- 3 orthogonal axes of any orientation.
- adapted to the study of movements on Earth and in its immediate vicinity.

Note: A terrestrial frame of reference may be used for motions not exceeding a few minutes.



Geocentric frame of reference.

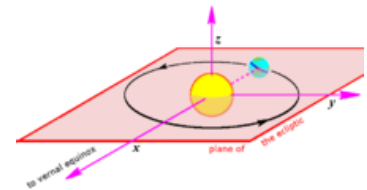
- origin at the centre of the Earth.
- one axis follows the Earth's axis of rotation, the other 2 point towards fixed stars.
- adapted to describe the movement of the Earth's satellites.

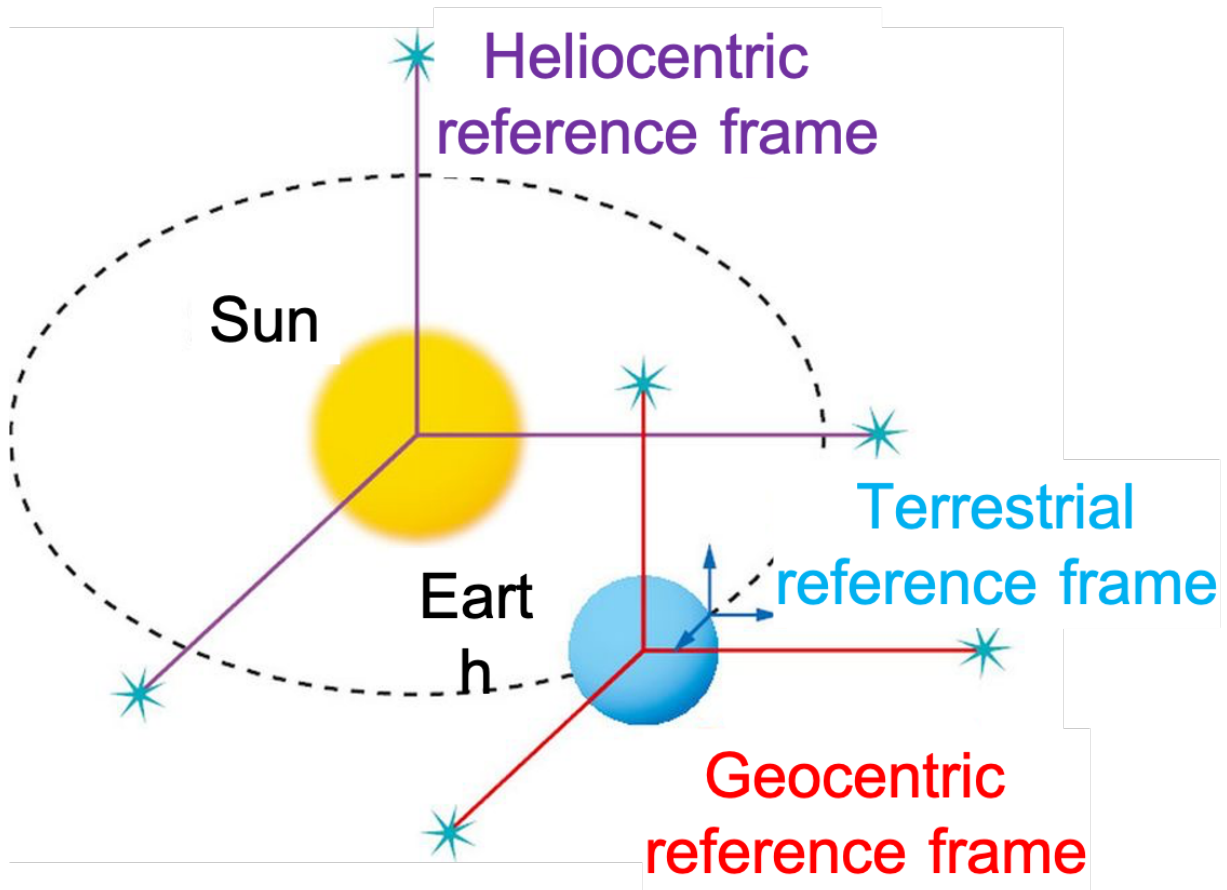
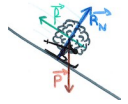
Note: A geocentric frame of reference can be considered for motions of the order of several days.

Heliocentric frame of reference.

- origin at the centre of the Sun.
- one axis is perpendicular to the plane of the ecliptic (the plane in which the centre of the Earth moves), the other 2 axes point towards fixed stars.
- adapted to the study of the motion of the planets in the solar system. The planets describe ellipses.

Note: A heliocentric frame of reference can be used for motions of up to several years.





IMPORTANCE OF THE FRAME OF REFERENCE

A student sitting at his desk revising for the next physics test is stationary relative to a terrestrial frame of reference, in uniform circular motion relative to the geocentric frame of reference, and follows the same motion as a spinning top relative to the heliocentric frame of reference. The motion of a system is therefore relative to the chosen reference solid.