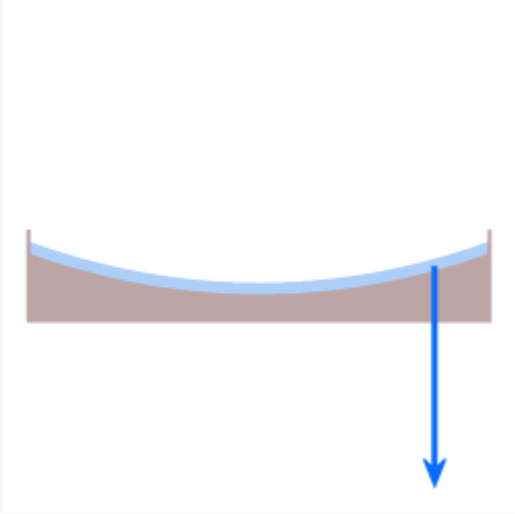
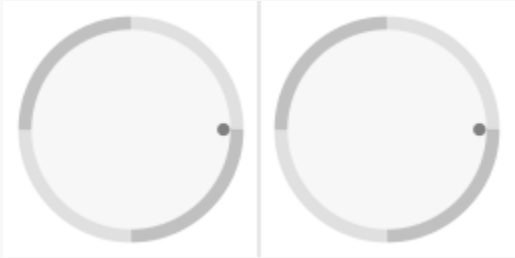
INERTIAL OSCILLATIONS - II

Motion over the surface of a parabolic dish



Picture 8. Image
The blue arrow represents the force of gravity. The red arrow represents the normal force. The resultant force provides the required centripetal force. (The curvature of the dish is very much exaggerated.)



Picture 9. Animation
Frictionless motion along the surface of a parabolic dish.

The left side of animation 9 depicts the motion as seen from a non-rotating point of view. The right side depicts the motion as seen from a co-rotating point of view.

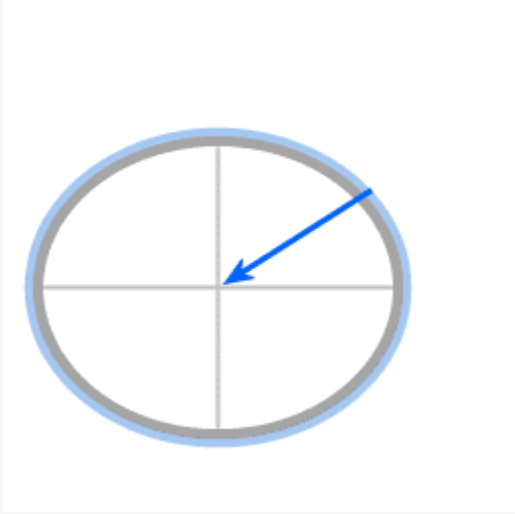
Categorizing deflection

It is important here to use a unambiguous definition of what is categorized as apparent deflection.
If a "deflection" is an artifact of mapping motion in a rotating coordinate system, then it is an apparent deflection. If a deflection is due to a force then it

is independent of what coordinate system the motion is mapped in. For example: the retrograde motion of the planet Mars is apparent motion, but the orbit of Mars around the Sun is not.

There is an oscillation in the distance of the puck to the center of rotation, and an oscillation of the angular velocity of the puck. That pattern of oscillations is accounted for as due to work being done by a centripetal force, and this pattern of oscillation is the same when mapping the motion in an inertial coordinate system and when mapping the motion in a rotating coordinate system.

Motion over the surface of an oblate spheroid



Picture 10. Image
Forces in the case of an oblate spheroid.
Blue: gravitation
Red: normal force
The resultant force provides the required centripetal force.

Picture 11. Animation
Inertial oscillation over the surface of an oblate speroid.

Animation 11 represents inertial oscillations of an object that is in motion over the surface of a rotating oblate spheroid.

Animation 6 represents a situation without involvement of a poleward force. Then, when an object is moving in westward direction with respect to the Earth, the object deviates to the left. That is where motion without the presence of a poleward force, and motion under the influence of the poleward force literally diverge.

In the case of ballistics there is *no force that acts in a direction parallel to the surface*. (That is, to a first approximation. For a more detailed discussion, see the center of gravity section of the 'Equatorial bulge' article).

In the case of an oblate spheroid there is a poleward force, in which case there can be inertial oscillation.

Source : http://www.cleonis.nl/physics/phys256/comparison.php