

1) Vecteurs rotations instantanées :

$$\vec{\Omega}_{b1/b0} = \dot{\phi} \vec{z}_0$$

$$\vec{\Omega}_{b2/b1} = \dot{\theta} \vec{x}_1$$

$$\vec{\Omega}_{b2/b0} = \dot{\phi} \vec{z}_0 + \dot{\theta} \vec{x}_1$$

2)

$$a. \vec{V}(M/R2) = \frac{db2 \overrightarrow{AM}}{dt} = \dot{r} \vec{z}_2$$

$$\vec{\Gamma}(M/R2) = \frac{db2 \vec{V}(M/R2)}{dt} = \ddot{r} \vec{z}_2$$

$$b. \vec{V}(M/R1) = \frac{db1 \overrightarrow{AM}}{dt} = \frac{db2 r \vec{z}_2}{dt} + \vec{\Omega}_{b2/b1} \wedge \overrightarrow{AM} = \dot{r} \vec{z}_2 + \dot{\theta} \vec{x}_1 \wedge r \vec{z}_2 = \dot{r} \vec{z}_2 - r \dot{\theta} \vec{y}_2$$

$$c. \vec{V}(M/R0) = \frac{db0 \overrightarrow{AM}}{dt} = \frac{db2 r \vec{z}_2}{dt} + \vec{\Omega}_{b2/b0} \wedge \overrightarrow{AM} = \dot{r} \vec{z}_2 + \dot{\phi} \vec{z}_0 + \dot{\theta} \vec{x}_1 \wedge r \vec{z}_2 = \dot{r} \vec{z}_2 - r \dot{\theta} \vec{y}_2$$