



## Truth Dynamics

$$\dot{\mathbf{r}}_{\text{obs}} = \mathbf{v}_{\text{obs}}$$

$$\dot{\mathbf{v}}_{\text{obs}} = \mathbf{a}_{\text{grav}}(\mathbf{r}_{\text{obs}})$$

$$\dot{\mathbf{r}}_{\text{rso}} = \mathbf{v}_{\text{rso}}$$

$$\dot{\mathbf{v}}_{\text{rso}} = \mathbf{a}_{\text{grav}}(\mathbf{r}_{\text{rso}}) + \mathbf{W} \quad \text{--- sized to } = J_2, \text{ Sun, Moon}$$

$$\dot{\mathbf{b}}_{\text{rd}} = -\frac{1}{\tau_{\text{rd}}} \mathbf{b}_{\text{rd}} + \mathbf{W}_{\text{rd}} \quad \leftarrow \sim T_{\text{obs}}/2$$

## Design model

$$\dot{\mathbf{r}}_{\text{rso}} = \mathbf{v}_{\text{rso}}$$

$$\dot{\mathbf{v}}_{\text{rso}} = \mathbf{a}_{\text{grav}}(\mathbf{r}_{\text{rso}}) + \mathbf{W}$$

$$\dot{\mathbf{b}}_{\text{rd}} = -\frac{1}{\tau_{\text{rd}}} \mathbf{b}_{\text{rd}} + \mathbf{W}$$

## Sensor models

$$\alpha = h_{\alpha}(\mathbf{r}_{\text{rso}}, \mathbf{r}_{\text{obs}}) + \mathbf{b}_{\alpha} + \mathbf{n}_{\alpha}$$

0.1 mrad      0.1 pixels

$$\delta = h_{\delta}(\mathbf{r}_{\text{rso}}, \mathbf{r}_{\text{obs}}) + \mathbf{b}_{\delta} + \mathbf{n}_{\delta}$$

## Nav Dynamics

$$\dot{\hat{\mathbf{r}}}_{\text{rso}} = \hat{\mathbf{v}}_{\text{rso}}$$

$$\dot{\hat{\mathbf{v}}}_{\text{rso}} = \mathbf{a}_{\text{grav}}(\hat{\mathbf{r}}_{\text{rso}})$$

$$\dot{\hat{\mathbf{b}}}_{\text{rd}} = -\frac{1}{\tau_{\text{rd}}} \hat{\mathbf{b}}_{\text{rd}}$$

















