1

1,2

(x_0, y_0)

$(0, 0)$

(x, y)

(ϕ, θ)



$(0, \pm 90^\circ)$

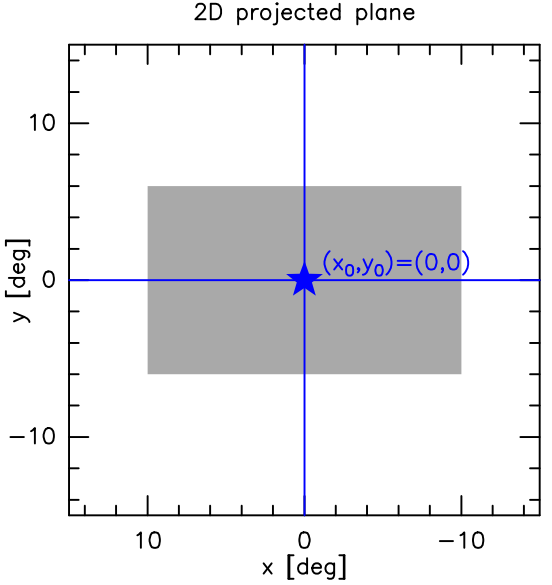
(α, δ)

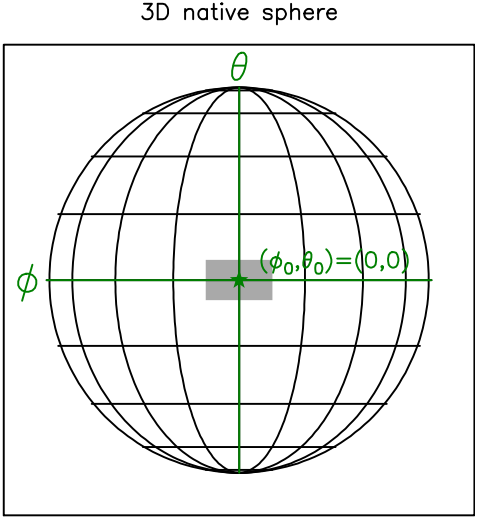
(α_0, δ_0)

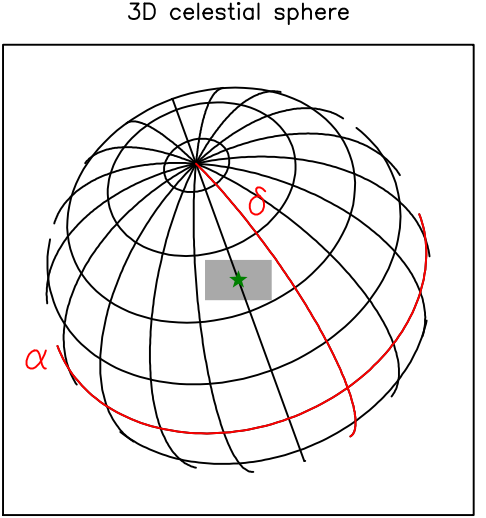
(ϕ_p, θ_p)

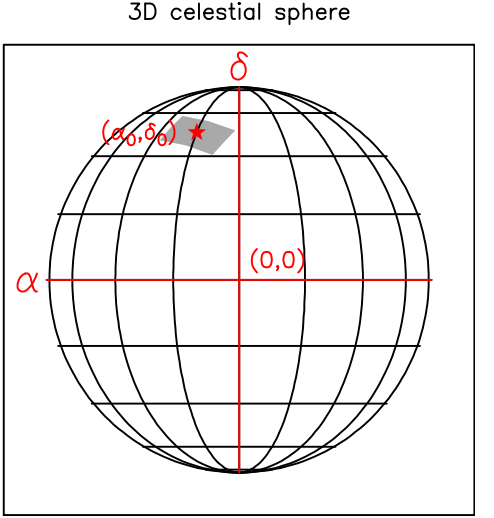
(α_p, δ_p)

20×12


2D projected plane
10
0
−10
y [deg]
(x0,y0)=(0,0)
10
0
−10
x [deg]


3D native sphere
θ
ϕ
(ϕ0,θ0)=(0,0)


3D celestial sphere
δ
α


3D celestial sphere
δ
(α0,δ0)
α
(0,0)

x

$$(\alpha - \alpha_0)\cos\delta,$$

y

$\delta - \delta_0.$

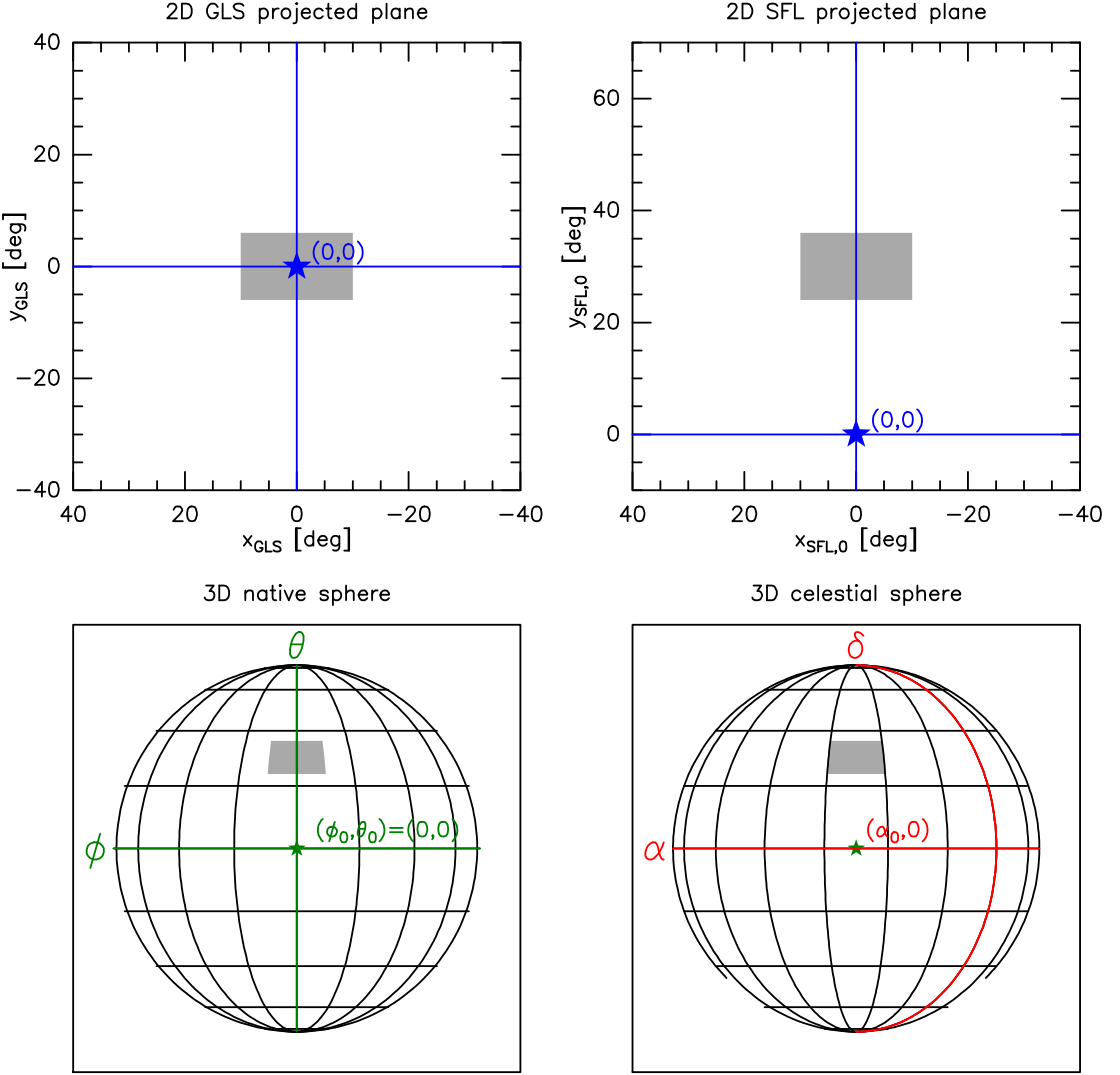
$(\alpha, \delta) = (0, 0)$

30°

$\delta_0 = 0$

α_0

50°


2D GLS projected plane
40
20
0
−20
−40
y_{GLS} [deg]
(0,0)
40
20
0
−20
−40
x_{GLS} [deg]
2D SFL projected plane
60
40
20
0
$y_{SFL,0}$ [deg]
(0,0)
40
20
0
−20
−40
$x_{SFL,0}$ [deg]
3D native sphere
θ
ϕ
$(\phi_0,\theta_0)=(0,0)$
3D celestial sphere
δ
α
$(\alpha_0,0)$

z

$$\sin\delta\cos\delta_0 - \cos\delta\sin\delta_0\cos(\alpha - \alpha_0)$$

θ

$$\cos^{-1}((\sin\delta - z\cos\delta_0)/\sin\delta_0)$$

r

$\tan \frac{\theta}{2}$

$r \sin p$

$r \cos p$

z

r

p

θ

$$\cos\theta = \sin\delta \sin\delta_0 + \cos\delta \cos\delta_0 \cos\Delta\alpha$$

$$r_{\mathrm{AIPS}} = 2\frac{\sin\theta}{1+\cos\theta}$$

$$r_{\mathrm{AIPS}} = 2 \tan \frac{\theta}{2}$$

$$\tan x = \frac{\sin x}{\cos x} = \frac{2\sin x\cos x}{2\cos^2 x} = \frac{\sin 2x}{1+\cos 2x}$$

$\tan(\theta/2) \simeq \theta/2$

$r \simeq \theta/2$

$r \simeq \theta$



-22000

$(\alpha - \alpha_0) \times cos(\delta - \delta_0)$

$\delta - \delta_0$

x

$\delta - \delta_0$

δ

$(\phi_0, \theta_0) = (0, 0)$

$$\phi_p = \begin{cases} 0^\circ & \text{for } \delta_0 \geq 0 \\ 180^\circ & \text{for } \delta_0 < 0 \end{cases}$$

$$\sin \phi_p = 0$$

$\delta_{p,1}$

$$(0, \cos\phi_p) + \cos^{-1}(\sin\delta_0)$$



$$(0, \cos\phi_p) - \cos^{-1}(\sin\delta_0)$$

(y, x)

$\delta_{p,1}$



$$\delta_p = \begin{cases} \delta_{p,1} & \text{if } \delta_{p,1} > 0 \text{ and } \delta_{p,1} \leq 90^\circ \\ \delta_{p,2} & \text{otherwise.} \end{cases}$$

$\delta_p = \pm 90^\circ$

α_p

$$\alpha_p = \begin{cases} \alpha_0 + \phi_p - 180^\circ & \text{for } \delta_p = +90^\circ \\ \alpha_0 - \phi_p & \text{for } \delta_p = -90^\circ \\ \alpha_0 - \operatorname{atan2}(0, -\frac{\sin\delta_p \sin\delta_0}{\cos\delta_p \cos\delta_0}) & \text{otherwise.} \end{cases}$$

α



$$(-\cos\theta\sin(\phi-\phi_p), \sin\theta\cos\delta_p - \cos\theta\sin\delta_p\cos(\phi-\phi_p))$$

δ

$$\sin^{-1}(\sin\theta\sin\delta_p + \cos\theta\cos\delta_p\cos(\phi - \phi_p))$$

$$(-\cos\delta\sin(\alpha-\alpha_p), \sin\delta\cos\delta_p - \cos\delta\sin\delta_p\cos(\alpha-\alpha_p))$$

$$\sin^{-1}(\sin\delta\sin\delta_p + \cos\delta\cos\delta_p\cos(\alpha - \alpha_p))$$

$\phi \cos \theta$

0°

$+90^\circ$

α_p

$\alpha_0 - 180^\circ$


$\phi_{\mathrm{SFL},0}$

$\phi_{\mathrm{SFL},0} = \mathrm{atan2}(-\cos\delta\sin(\alpha-\alpha_0-180^\circ), -\cos\delta\cos(\alpha-\alpha_0-180^\circ)) = \alpha-\alpha_0$

$(-y, -x) =$

$(y, x) + 180^\circ$

$\theta_{\mathrm{SFL},0}$

$$\theta_{\mathrm{SFL},0} = \sin^{-1}(\sin\delta) = \delta$$



$$(\alpha - \alpha_0)\cos\delta$$



x

$= (\alpha - \alpha_0) \cos \delta$

y

$+\delta_0 = \delta$



$, y'$

$) = (x_{\mathrm{SFL},0}, y_{\mathrm{SFL},0})$

x

$= x_{\mathrm{SFL},0}$

y

$= y_{\mathrm{SFL},0} - \delta_0$

$(3600, -1800), (3600, +1800)$

$(-200, 0)$

$\delta_0 \neq 0$