II

with:
lat = λ
lon = φ

We can write for $B\phi \neq \phi$

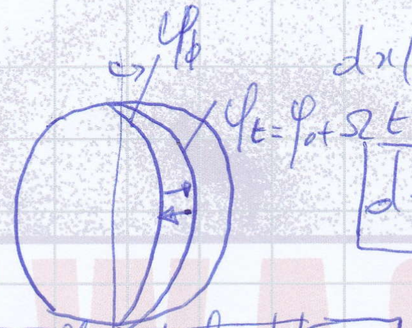
$$\cos(\varphi(t)) = \cos(\varphi_0 + \Omega t)$$

$$V_{x(t)} = \Omega R \cos(\lambda) \cos\varphi(t) = \Omega\, dx(t)$$

so

$$dx(t) = \int_{\varphi_0}^{\varphi_0+\Omega t} R\cos(\lambda)\cos\varphi(t)\,dt$$

$$dx(t) = \Omega R\cos(\lambda)\int_{\varphi_0}^{\varphi_0+\Omega t}\cos\varphi(t)\,dt$$



$$\boxed{dx(t) = R\cos(\lambda)\left[\sin(\varphi_0+\Omega t) - \sin(\varphi_0)\right]}$$

solar differential rotation
$$\Omega_{(lat)} = a + b\sin^2(lat) + c\sin^4(lat)$$

$$V_y(t) = \Omega R\cos(\lambda)\sin\varphi_{(t)}\sin(B\phi) = \Omega\, dy(t)$$

$$dy(t) = \int R\cos(\lambda)\sin\varphi_{(t)}\sin(B\phi)\,dt$$

$$dy(t) = R\cos(\lambda)\sin(B\phi)\int_{\varphi_0}^{\varphi_0+\Omega t}\sin\varphi_{(t)}\,dt$$

$$dy(t) = R\cos(\lambda)\sin B\phi\left[-\cos(\varphi_0+\Omega t) + \cos(\varphi_0)\right]$$

$$\boxed{dy(t) = -R\cos\lambda\sin B\phi\left[\cos(\varphi_0+\Omega t) - \cos(\varphi_0)\right]}$$

Conclusion

To derotate the solar image for the CST, we used $dx(t)$ and $dy(t)$ formulae