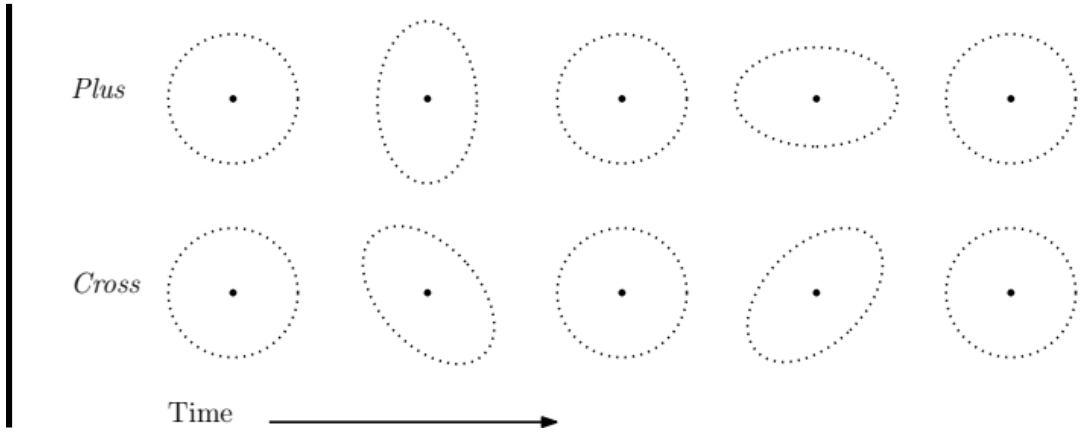
Cyril Cano (cyril.cano@gipsa-lab.fr) et al.

Gravitational-wave polarimetry with quaternions and application to precessing binaries

Gravitational waves are polarized



Each detector measures a linear combination

$$\frac{\Delta L(t)}{L} = h_+(t)F_+(\Theta) + h_\times(t)F_\times(\Theta)$$

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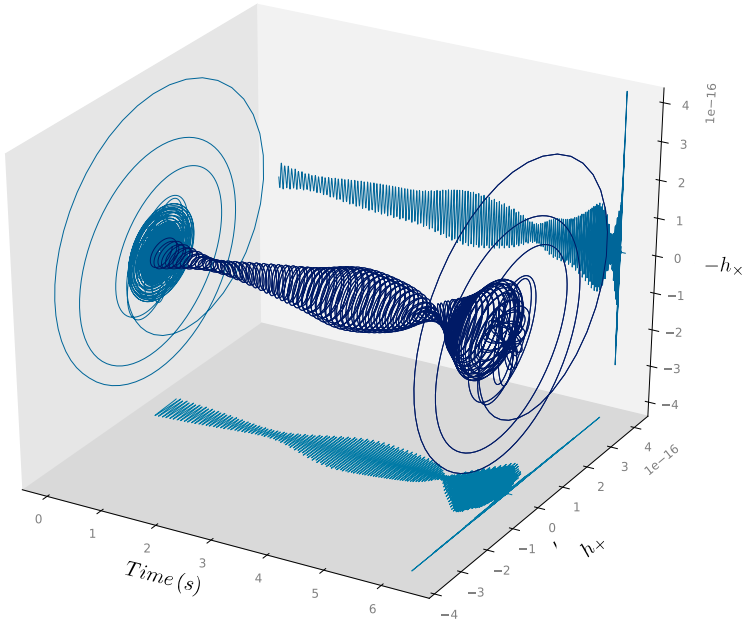
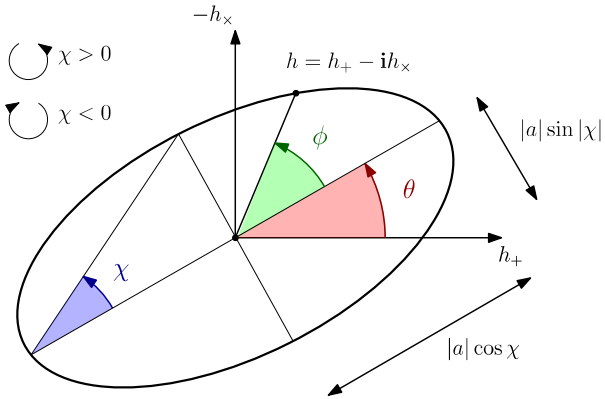


$$h = h_+ - \mathbf{i}h_\times$$

Quaternionic embedding



$$h_{\mathbb{H}} = ae^{\mathbf{i}\theta}e^{-\mathbf{k}\chi}e^{\mathbf{j}\phi}$$

Take-home message

- Quaternionic time-frequency transform allows the ‘unmodelled’ characterization of the polarization state
- Offer a natural formalism for reconstruction of bivariate signals with polarization targetting priors
- Allows to build features to describe bivariate signals (Allows to learn a GW generative model)