Title: Town Hall

Speakers:

Collection: 50 Years of Horndeski Gravity: Exploring Modified Gravity

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Modified gravity in the strong field regime: Panel discussion

Panelists: Enrico Barausse, Laura Bernard, Maxence Corman, Suvendu Giri

Moderator: William East

July 16

Opening questions:

1. Trying to compute strong field dynamics in modified gravity theories can be challenging and time consuming – how do we choose which theories are worth the effort? How does one balance theoretical motivation, phenomenological interest, and computational tractability?
2. What are some of the biggest impediments to connecting theory and observations of black holes and gravitational waves for modified gravity, and how might those be overcome? How does your favorite technique/expertise fit in the larger context of this effort?
3. What current or upcoming observational probes of gravity are you most excited about? Are we prepared to make good use of these in terms of data analysis and theoretical techniques?
4. What are the pros and cons of theory agnostic approaches to searching for modifications to general relativity versus targeting specific theories?

ich theories are worth the effort?

Inspired by QG? Probably not testable in the IR (i.e. with astrophysics). Exceptions are BH horizons & inflation

Inspired by cosmology? Need screening to pass local tests (e.g. solar system). This makes perturbative treatments (e.g. PN) unfeasible and Cauchy problem potentially ill-posed

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How do we choose which theories are worth the effort?

- Focus on theories that have well-posed initial value problem and are phenomenologically interesting.

What are some of the biggest impediments to connecting theory and observations of black holes and gravitational waves for modified gravity?

- The zoo of possibilities and absence of preferred UV complete candidate
- Unaccounted physics already in GR, environmental effects etc.
- The initial-value problem can be really a roadblock but is essential to get predictions for the merger where we need numerics.

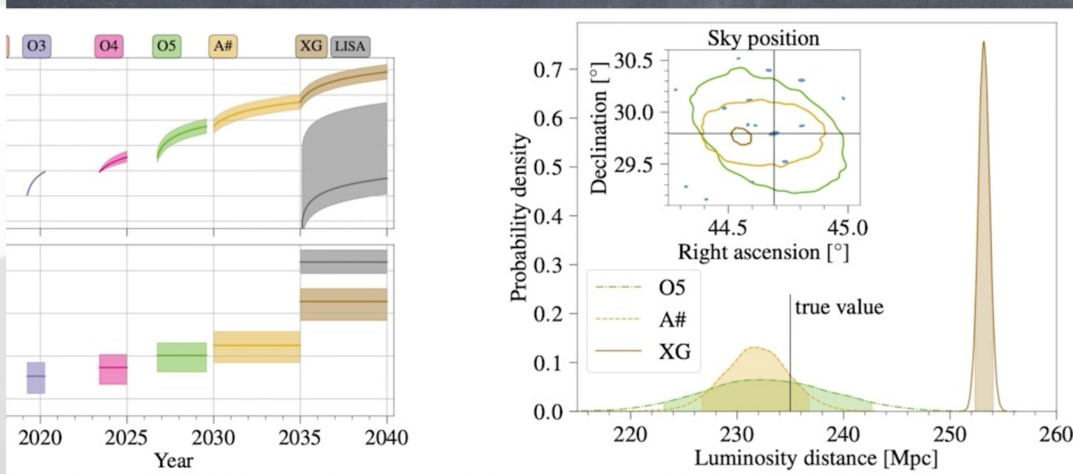
Roadblocks in comparison with data?

/s: if we see a deviation from our templates, is it dified gravity? Other possibilities:

- Waveform systematics
- Noise non-stationarity/non-Gaussianity
- Deviations from vacuum (environmental effects)
- Data analysis (overlapping sources)

T: grastrophysics (degeneracy between modified vity and emission model)

An exciting future: GWs!



edits: Arnab Dhani

Guaranteed to see deviations from current predictions
(if anything, from environment/systematics)

What are the pros and cons of theory agnostic approaches to searching for modifications to general relativity versus targeting specific theories?

Pros

- Represent larger class of modified theories of gravity.
- If signal strong enough might be good enough to pick up deviation.
- Flexible/easier to implement

Cons

- A consistent modified theory will introduce deviations in a more complicated and correlated manner, that parametric tests may be insensitive to.
- There could be subtleties in trying to map constraints on parametric deviations to constraints on parameters in specific theories related.
- Need theory specific tests to test, improve and motivate generic tests.
- Theory specific tests allow us in principle to place stronger constraints.
- If we do pick up a deviation will need theory specific tests to interpret signal and extract physics.