Dynamics in n-dim Gauss-Bonnet gravity
I. Colliding Scalar Waves   II. Wormhole evolutions

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Outline & Summary

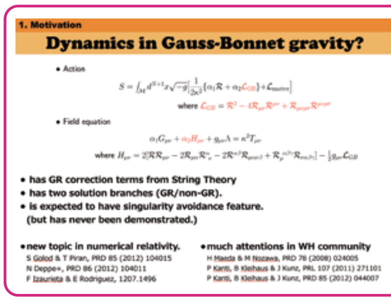
We show how the dynamics depend on the dimensionality and how the higher-order curvature terms affect to singularity formation in two models: (I) colliding scalar pulses in planar space-time, and (II) perturbed wormhole in spherical symmetric space-time.

Our numerical code uses dual-null formulation, and we compare the dynamics in 5, 6 and 7-dimensional Gauss-Bonnet gravity.

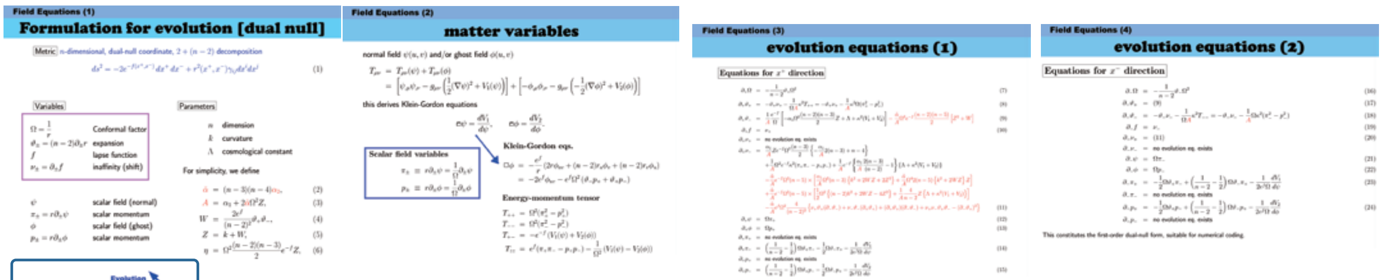
(1) For scalar wave collisions, we observe that curvarure evolutions (Kretschmann invariant) are milder in the presence of Gauss-Bonnet term and/or in higher-dimensional space-time.

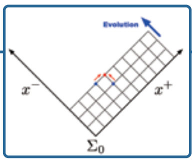
(2) For wormhole dynamics, we observe that the perturbed throat will be easily enhance in the presence of Gauss-Bonnet term.

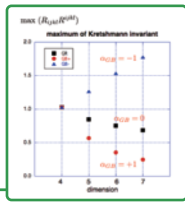
Both suggest that the thresholds for the singularity formations become higher in Gauss-Bonnet gravity, although it is not evitable.



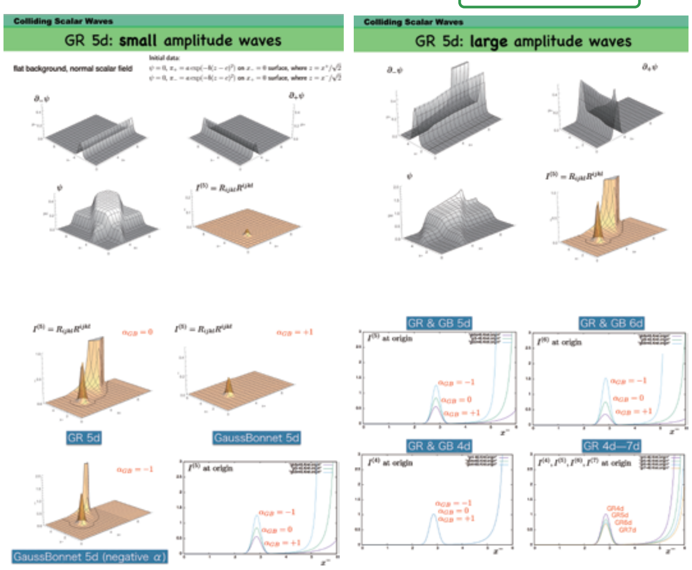
Field Eqs.



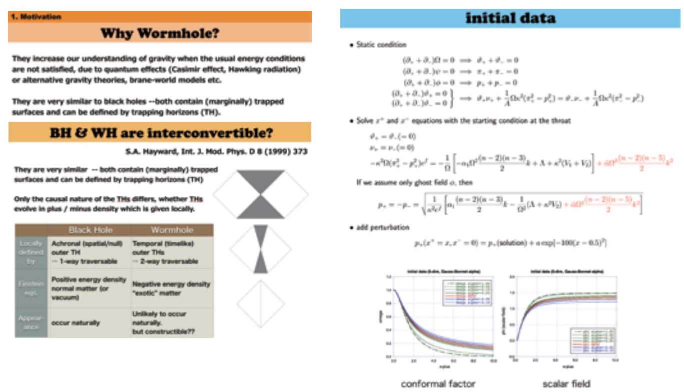




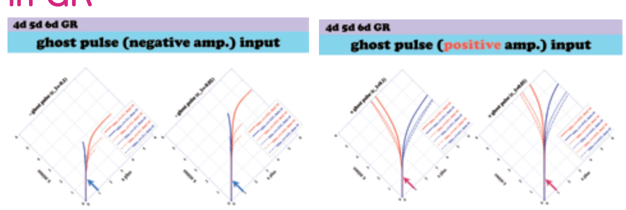
Colliding Scalar Waves



Wormhole Evolutions

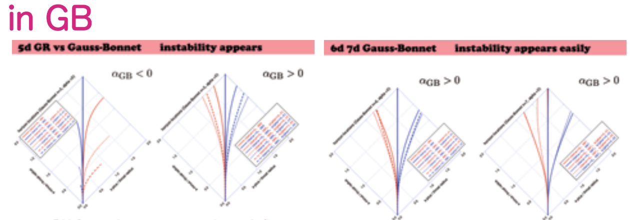


in GR

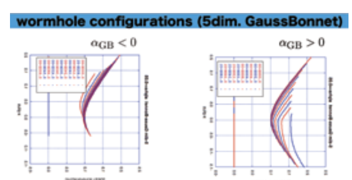


positive energy input --> BH formation   negative energy input --> throat inflates

in GB



BH formation   throat inflates   6 dim.   7 dim.



Results in 4-dim. GR

PRD66 (2002) 044005

Time Machine & Science of Space-time (HS, 2011)

Bifurcation of the horizons
-- go to a Black Hole or Inflationary expansion

Ghost pulse input -- Bifurcation of the horizons