Supplementary Information for

Coordinating tiny limbs and long bodies: geometric mechanics of lizard terrestrial swimming

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This PDF file includes:

Figs. S1 to S3 (not allowed for Brief Reports)
Legend for Movie S1

Other supplementary materials for this manuscript include the following:

Movie S1

1. Supplementary movie caption

Movie S1. 0:04-1:17, videos of lizards and snake moving on granular media. 1:18-1:43, videos of fully limbed lizards moving on aerated sands. 1:44-3:14, videos of robophysical experiments.

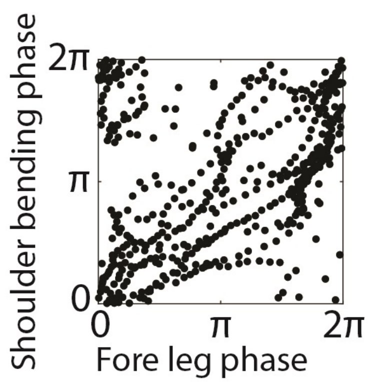

Fig. S1. The phase relationship between shoulder bending and fore leg movement.

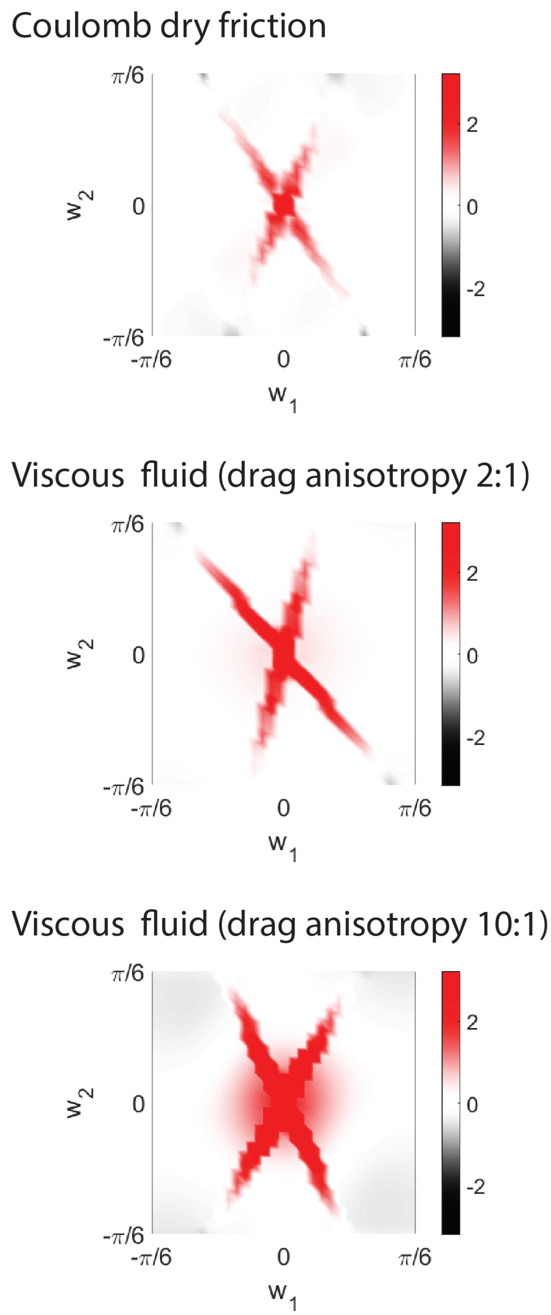

Fig. S2. Height functions to explain the use of traveling wave in short limbed elongate lizards. To bound the uncertainty in the actual ground reaction force, we used different ground reaction force models and had similar conclusions: (top) Rate-independent isotropic Coulomb dry friction. (middle) Viscous fluid with drag anisotropy 2:1. (bottom) Viscous fluid with drag anisotropy 10:1. In all those cases, two stripes emerge, similar to our conclusion in Fig. 4

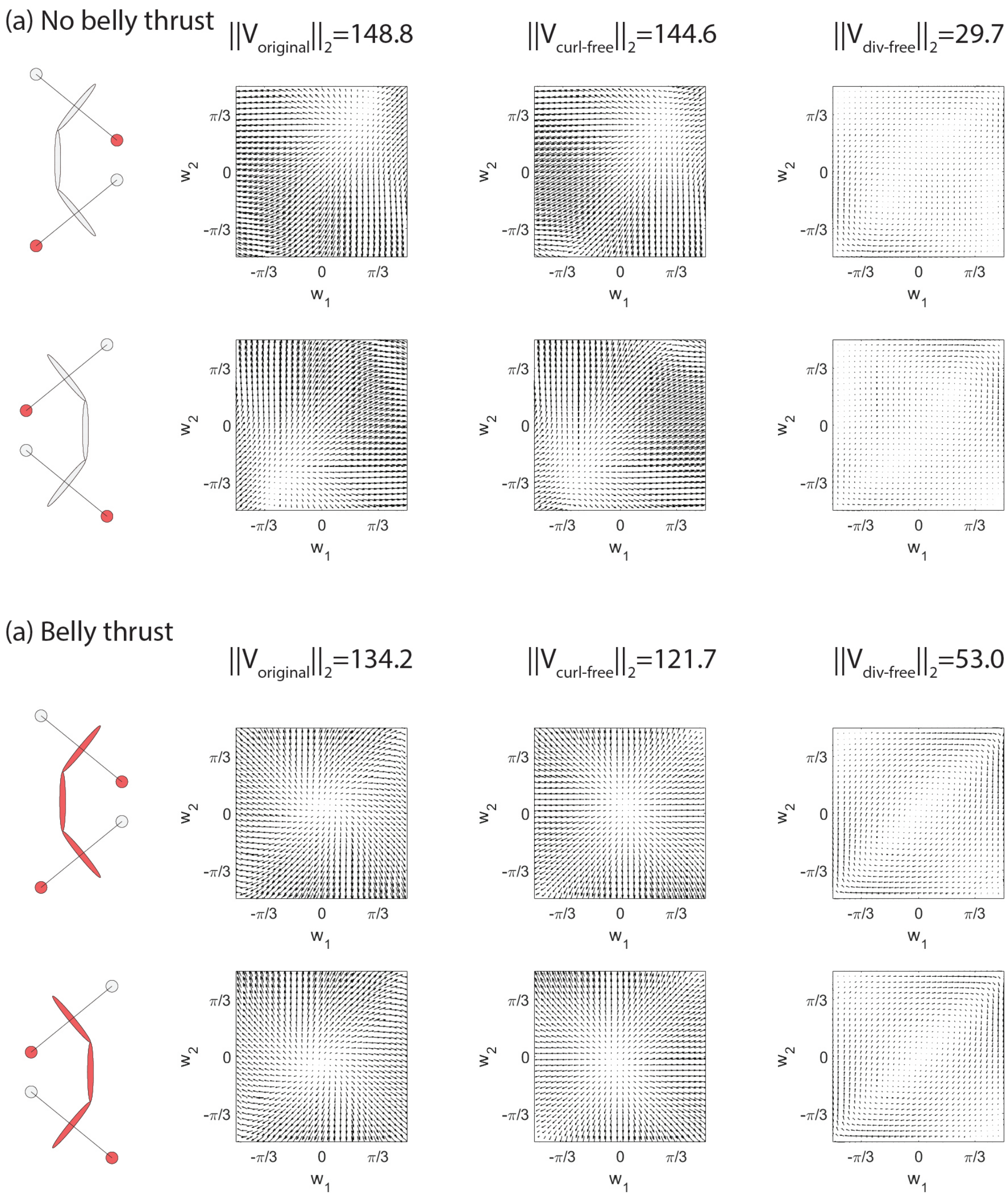

Fig. S3. Using Hodge-Helmholtz decomposition (HHD) to interpret the effectiveness of traveling-wave We use HHD on the connection vector field (left panel) and compare the norm of curl-free component (middle panel) and divergence-free component (right panel) (a) For locomotors with no belly thrust, the connection vector field is almost curl-free, evidenced by large magnitude in curl-free vector field and low magnitude in divergence-free vector field. Vector field for diagonal contact and counter diagonal contact are both illustrated. (b) For locomotors with belly thrust, the divergence-free vector field is no longer negligible, evidenced by large magnitude in divergence-free vector field.