

1 **On the crucial role of aortic valve architecture for healthy blood**
2 **flow and for valve replacement. Part II: energy anisotropy and**
3 **spectral analysis**

4 **Supporting information**

5 Pascal Corso¹, Dominik Obrist¹

6 **Affiliations:** ¹ARTORG Center for Biomedical Engineering Research, University of Bern,
7 Bern, Switzerland.

8 **Correspondence:** Pascal Corso, University of Bern, Bern, Switzerland.

9 E-mail: `pascal.corso@unibe.ch`

¹⁰ Supplementary material

¹¹ [Figure 1 about here.]

¹² [Figure 2 about here.]

¹³ [Table 1 about here.]

List of Figures

S1	Helical structures and streamlines coloured with velocity magnitude downstream of the considered severe aortic stenosis and of the two newly designed bioprosthetic aortic valves. The helical structures are highlighted via iso-contours of local helicity normalised with the spatially and temporally averaged helicity value for each valvular case. Red structures correspond to right-handed swirling motion whereas blue structures represent left-handed helical motion.	4
S2	Maximum over systolic time instances of the modal kinetic energy dynamics as a function of the scalar angular wavenumber for the three valvular cases. (a) Normalised time-derivative of the modal kinetic energy. (b) Ratio of the rate of KE transfer and the time-derivative of the modal KE. (c) Ratio of the modal KE dissipation rate and the time-derivative of the modal KE.	5

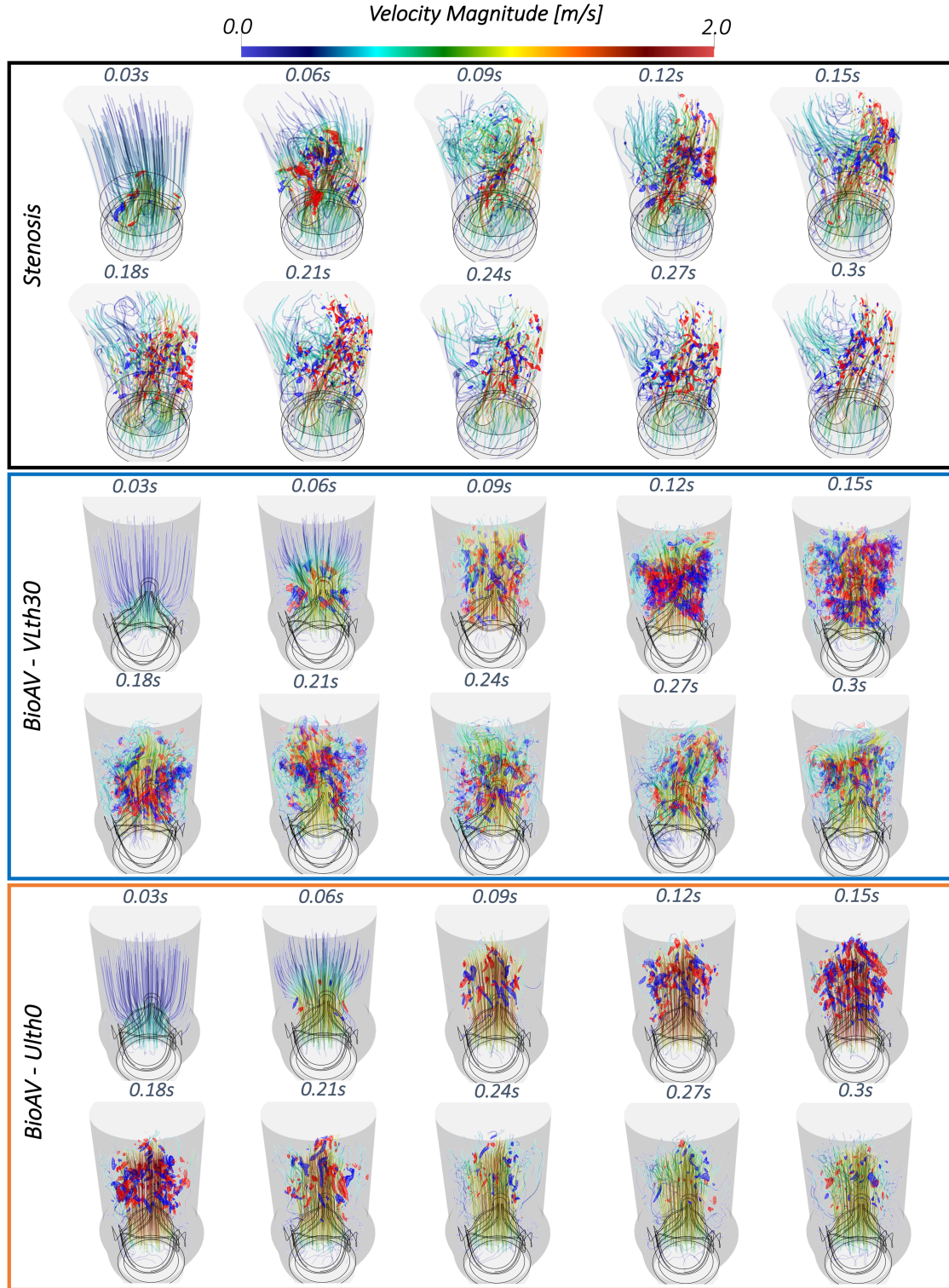


Figure S1: Helical structures and streamlines coloured with velocity magnitude downstream of the considered severe aortic stenosis and of the two newly designed bioprosthetic aortic valves. The helical structures are highlighted via iso-contours of local helicity normalised with the spatially and temporally averaged helicity value for each valvular case. Red structures correspond to right-handed swirling motion whereas blue structures represent left-handed helical motion.

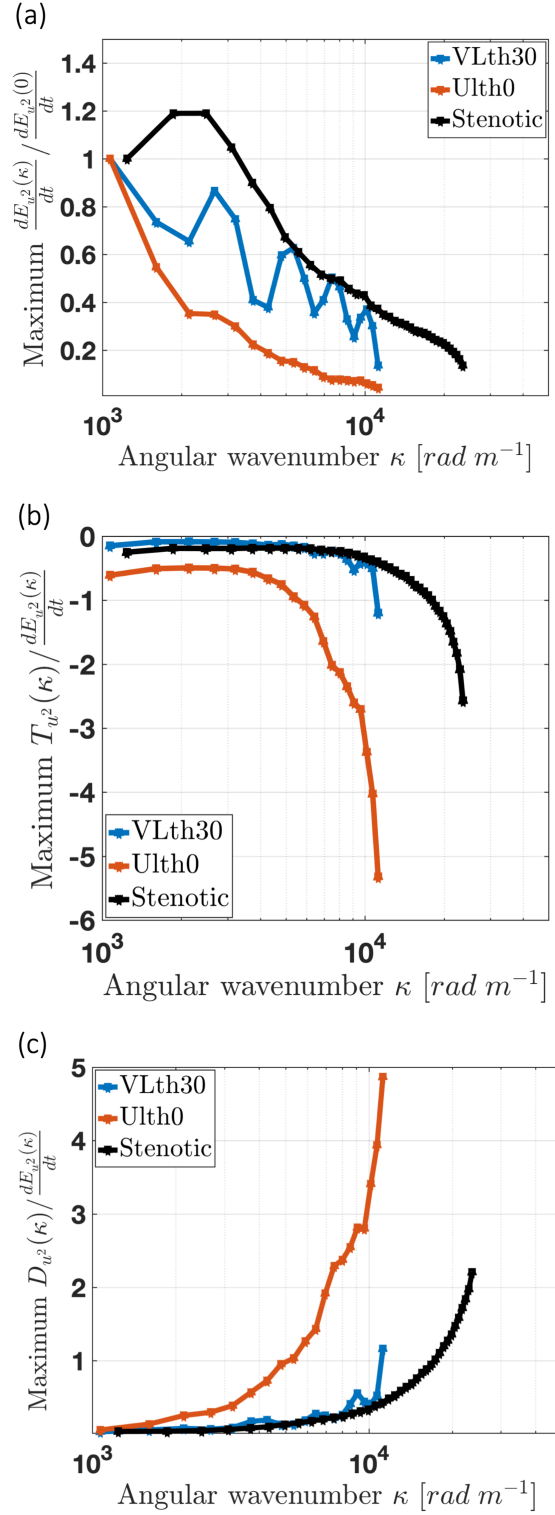


Figure S2: Maximum over systolic time instances of the modal kinetic energy dynamics as a function of the scalar angular wavenumber for the three valvular cases. (a) Normalised time-derivative of the modal kinetic energy. (b) Ratio of the rate of KE transfer and the time-derivative of the modal KE. (c) Ratio of the modal KE dissipation rate and the time-derivative of the modal KE.

27 List of Tables

28	1	Coefficients of the power law for the three valvular configurations used to	
29		correlate the modal KE anisotropy with the normalised helicity intensity. The	
30		coefficient of determination R^2 is employed to assess the accuracy of the least-	
31		square fitting of the power law based on the training and testing datasets. .	7

Table 1: Coefficients of the power law for the three valvular configurations used to correlate the modal KE anisotropy with the normalised helicity intensity. The coefficient of determination R^2 is employed to assess the accuracy of the least-square fitting of the power law based on the training and testing datasets.

	A	B	Training - R^2	Testing - R^2
Stenotic	627.1	-0.81	0.43	0.11
BioAV - VLth30	80.9	-0.375	0.73	0.75
BioAV - Ulth0	24.2	-0.16	0.11	0.1