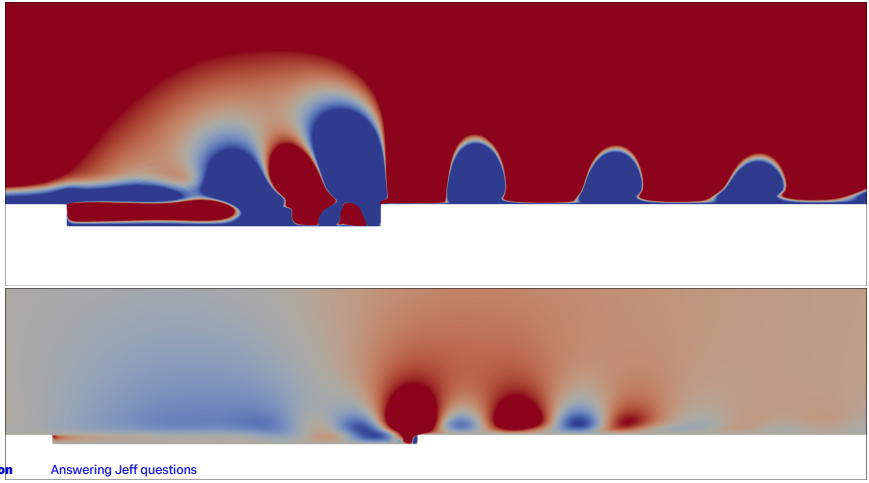
IMPERIAL

Answering Jeff questions

Víctor Ballester
June 16, 2025

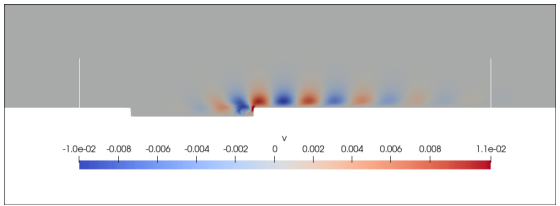
Absolute instability going up to the upstream edge of the gap?

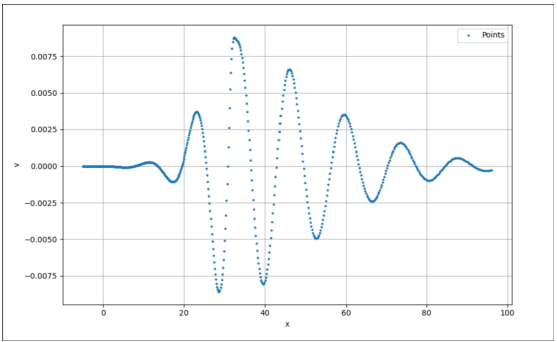
- No. The colors are stressed, but they show that the absolute instability is localized near the downstream edge of the gap.



Aboslute instability in the gap

SFD for d $= 2.25$, w $= 32$ Most unstable mode (with positive growth rate):





Frequency comparison in a chaotic regime

- We study the case d $= 3.83$, w $= 20$ (see the figure below)
- Jeff claims that the dominant nondimensional frequency before transitioning is F $= 10^6 \omega\nu/\mathsf{U}^2 = 168$
- In our case, using that formula we have that F $= 10^3\omega$ (right? because U $= 1$ and $\nu = \frac{1\times1}{1000}$).

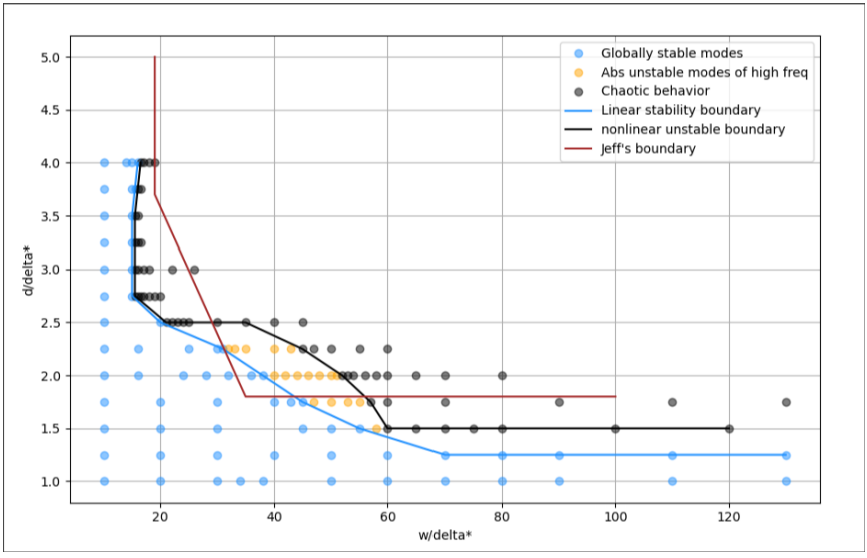
x $= \mathsf{w} + 5\delta^*$
Dominant freq for **u**
$\omega : 66.428, \widehat{\mathsf{f}}(\omega) : 784.87$
$\omega : 67.377, \widehat{\mathsf{f}}(\omega) : 539.07$
$\omega : 65.479, \widehat{\mathsf{f}}(\omega) : 224.81$
$\omega : 200.234, \widehat{\mathsf{f}}(\omega) : 204.94$
$\omega : 68.326, \widehat{\mathsf{f}}(\omega) : 202.40$
Dominant freq for **v**
$\omega : 66.428, \widehat{\mathsf{f}}(\omega) : 100.81$
$\omega : 133.806, \widehat{\mathsf{f}}(\omega) : 73.76$
$\omega : 67.377, \widehat{\mathsf{f}}(\omega) : 68.54$
$\omega : 668.080, \widehat{\mathsf{f}}(\omega) : 62.39$
$\omega : 801.886, \widehat{\mathsf{f}}(\omega) : 56.22$

x $= \mathsf{w} + 25\delta^*$
Dominant freq for **u**
$\omega : 66.856, \widehat{\mathsf{f}}(\omega) : 578.61$
$\omega : 133.712, \widehat{\mathsf{f}}(\omega) : 390.67$
$\omega : 200.567, \widehat{\mathsf{f}}(\omega) : 239.15$
$\omega : 401.135, \widehat{\mathsf{f}}(\omega) : 152.63$
$\omega : 267.423, \widehat{\mathsf{f}}(\omega) : 147.29$
Dominant freq for **v**
$\omega : 401.135, \widehat{\mathsf{f}}(\omega) : 94.62$
$\omega : 467.990, \widehat{\mathsf{f}}(\omega) : 80.02$
$\omega : 534.846, \widehat{\mathsf{f}}(\omega) : 77.23$
$\omega : 133.712, \widehat{\mathsf{f}}(\omega) : 63.12$
$\omega : 334.279, \widehat{\mathsf{f}}(\omega) : 62.55$

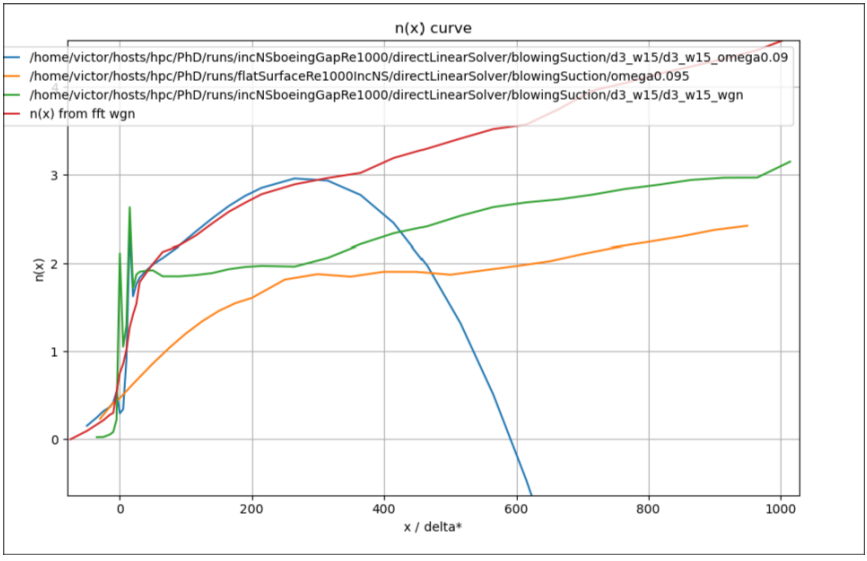
x $= \mathsf{w} + 75\delta^*$
Dominant freq for **u**
$\omega : 133.712, \widehat{\mathsf{f}}(\omega) : 413.21$
$\omega : 66.856, \widehat{\mathsf{f}}(\omega) : 364.18$
$\omega : 267.423, \widehat{\mathsf{f}}(\omega) : 351.61$
$\omega : 200.567, \widehat{\mathsf{f}}(\omega) : 284.69$
$\omega : 334.279, \widehat{\mathsf{f}}(\omega) : 154.04$
Dominant freq for **v**
$\omega : 267.423, \widehat{\mathsf{f}}(\omega) : 152.65$
$\omega : 133.712, \widehat{\mathsf{f}}(\omega) : 74.76$
$\omega : 334.279, \widehat{\mathsf{f}}(\omega) : 71.96$
$\omega : 200.567, \widehat{\mathsf{f}}(\omega) : 63.06$
$\omega : 467.990, \widehat{\mathsf{f}}(\omega) : 49.21$

x $= \mathsf{w} + 175\delta^*$
Dominant freq for **u**
$\omega : 133.917, \widehat{\mathsf{f}}(\omega) : 279.11$
$\omega : 66.490, \widehat{\mathsf{f}}(\omega) : 195.30$
$\omega : 71.173, \widehat{\mathsf{f}}(\omega) : 158.22$
$\omega : 132.981, \widehat{\mathsf{f}}(\omega) : 149.71$
$\omega : 67.427, \widehat{\mathsf{f}}(\omega) : 148.11$
Dominant freq for **v**
$\omega : 133.917, \widehat{\mathsf{f}}(\omega) : 45.03$
$\omega : 200.408, \widehat{\mathsf{f}}(\omega) : 42.09$
$\omega : 271.581, \widehat{\mathsf{f}}(\omega) : 32.03$
$\omega : 195.725, \widehat{\mathsf{f}}(\omega) : 27.78$
$\omega : 138.600, \widehat{\mathsf{f}}(\omega) : 26.89$

Stability curve



n-factor computations



n-factor computations