

Inestabilidades en un flujo entre placas paralelas con una obstrucción porosa

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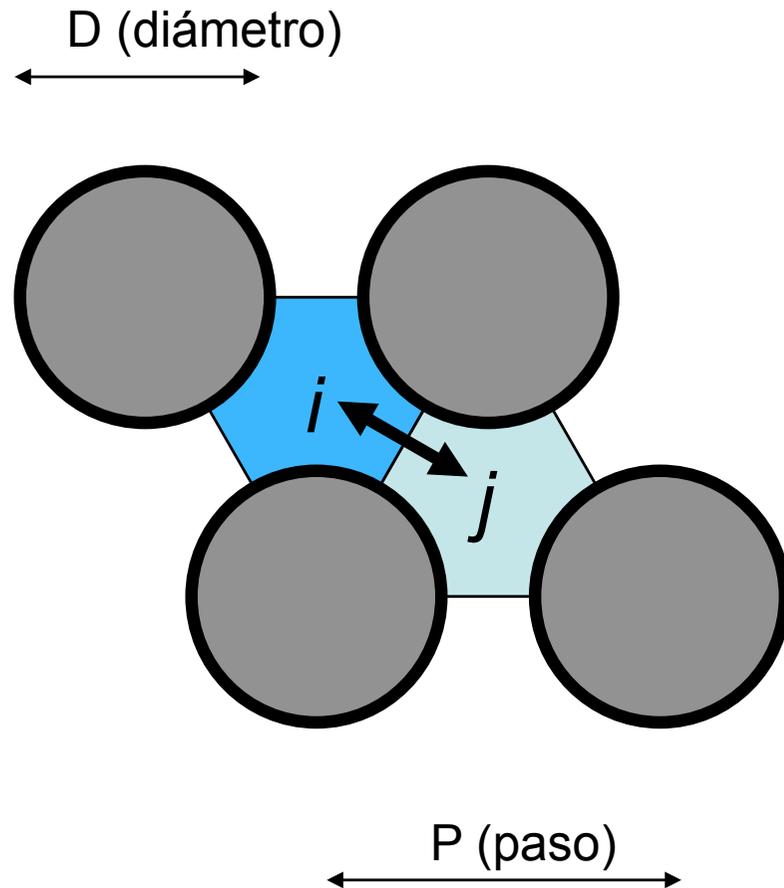
Alejandro Clausse

Reactores de potencia

- Nucleo: barras combustibles paralelas



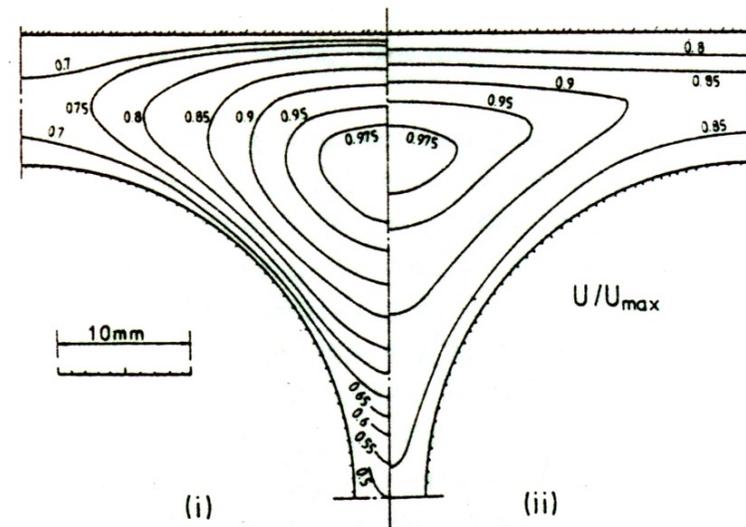
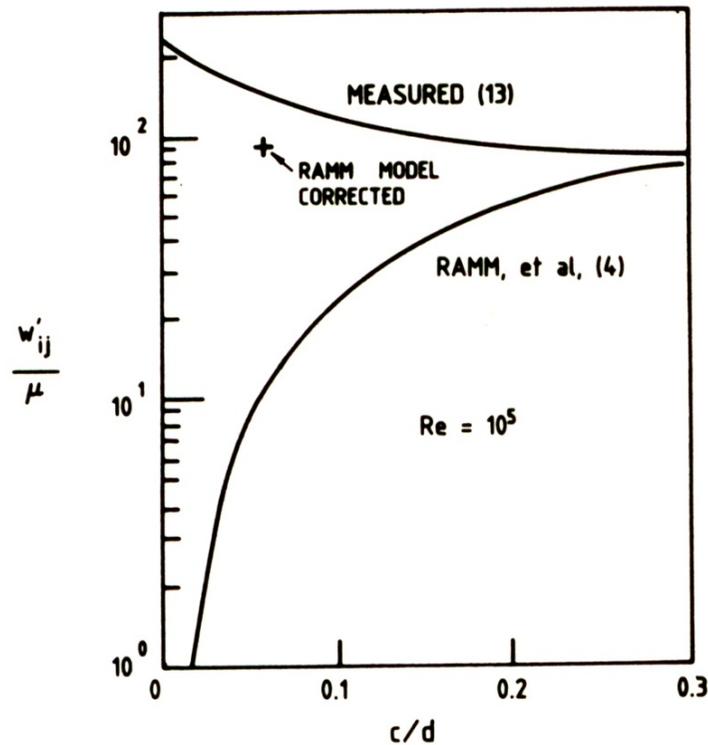
Modelado de combustibles de barras: Subcanales



- Cada subcanal se piensa como un “ducto”
- Cada subcanal recibe calor de las barras combustibles
- Los subcanales intercambian masa y calor con sus vecinos
 - Flujo cruzado
 - Mezclado turbulento

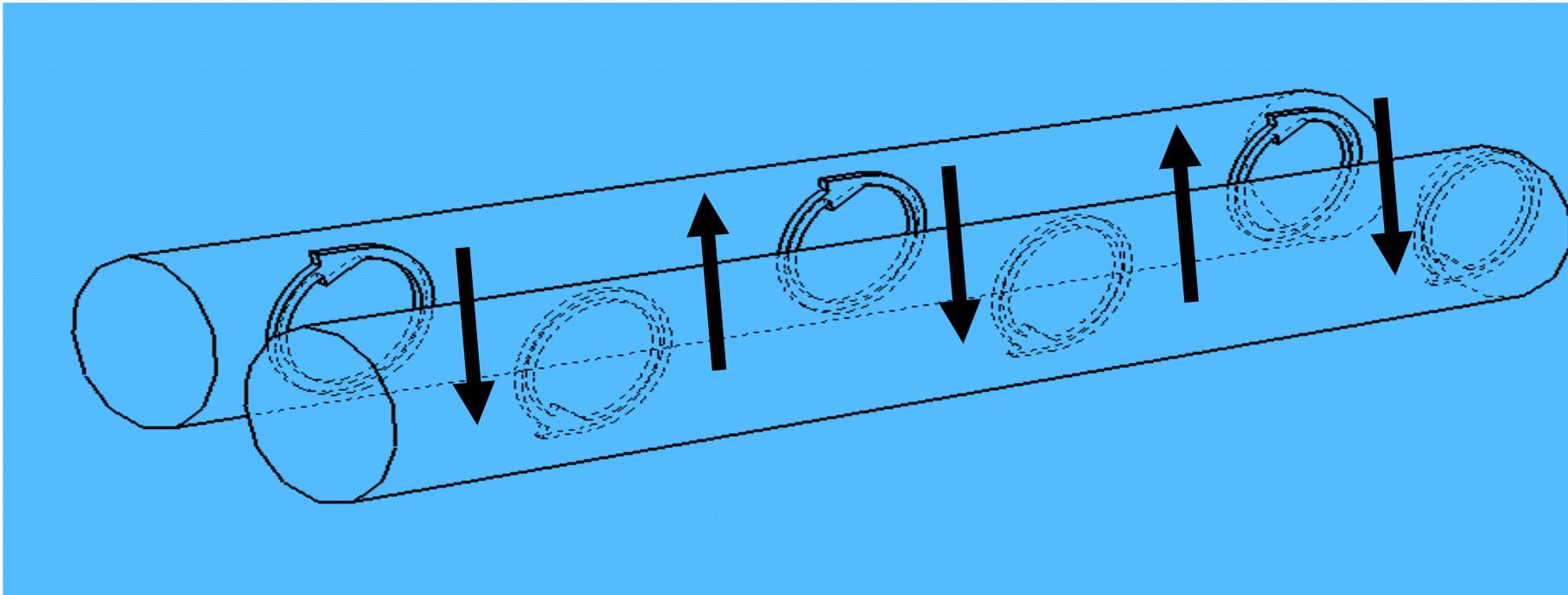
Aspectos “Peculiares”

- Mezclado mucho mayor al estimado con modelos de turbulencia isotrópica

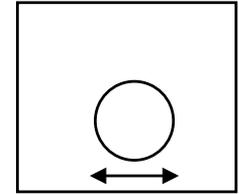
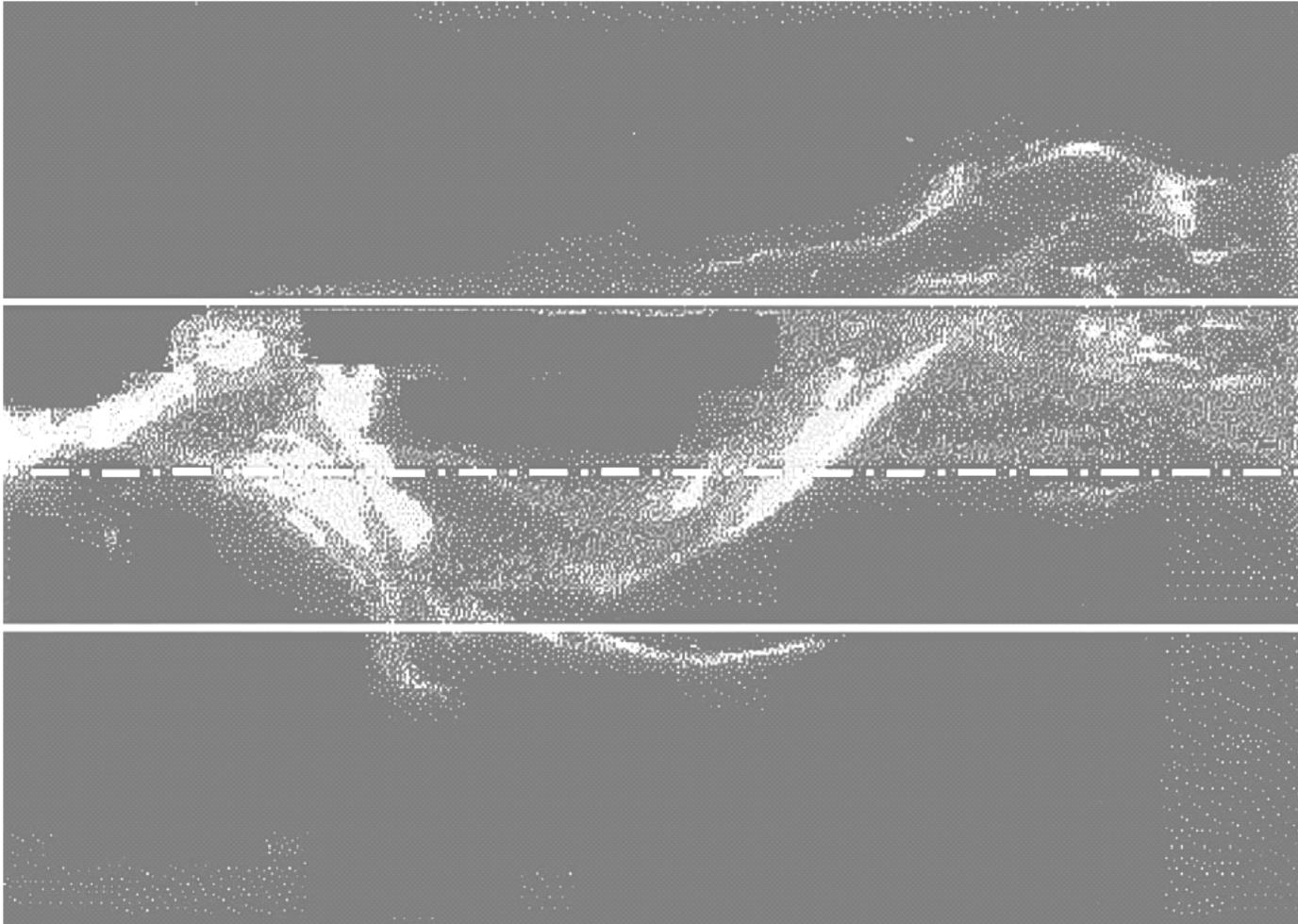


Estructuras de gran escala

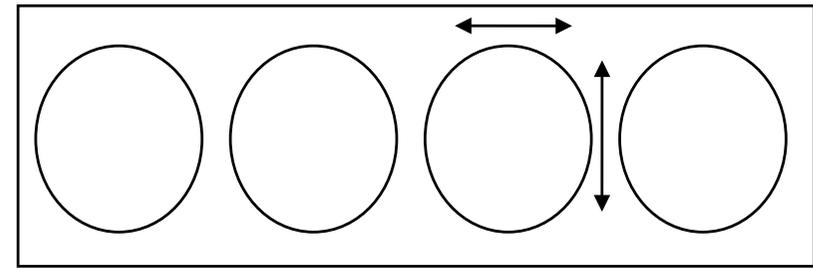
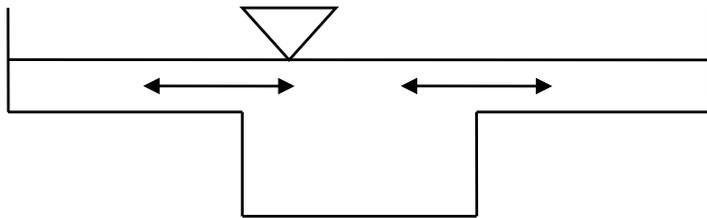
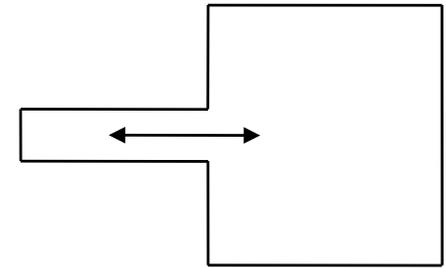
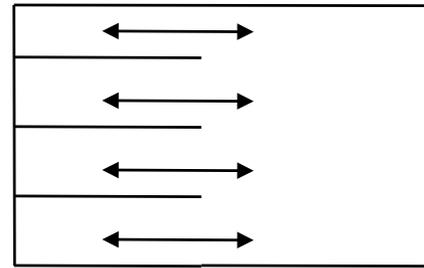
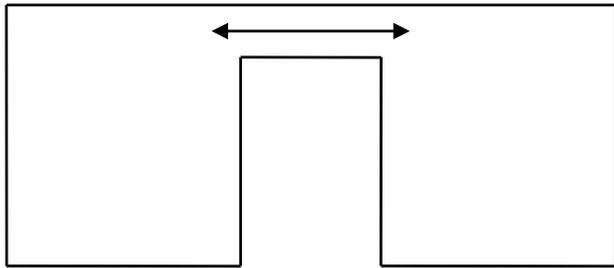
- Entre 196X y 1984 se genera la idea de que existe un fenómeno de estructuras de gran escala. En 1984 Hooper y Rehme lo sitúan como fenómeno dominante en el mezclado
- Estas estructuras son muy eficientes en el mezclado



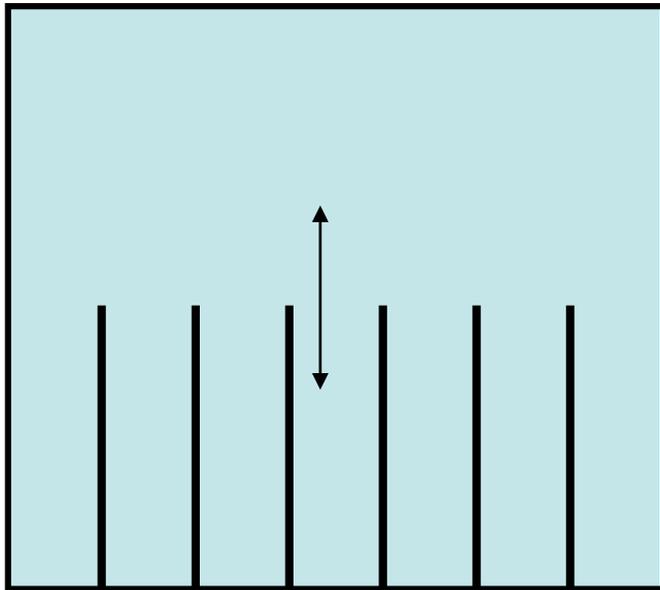
Inestabilidades de flujo laminar



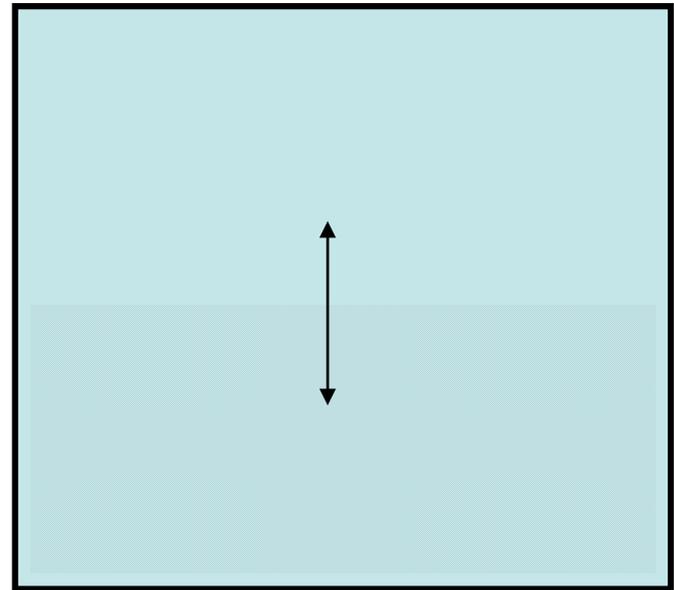
En otras geometrías



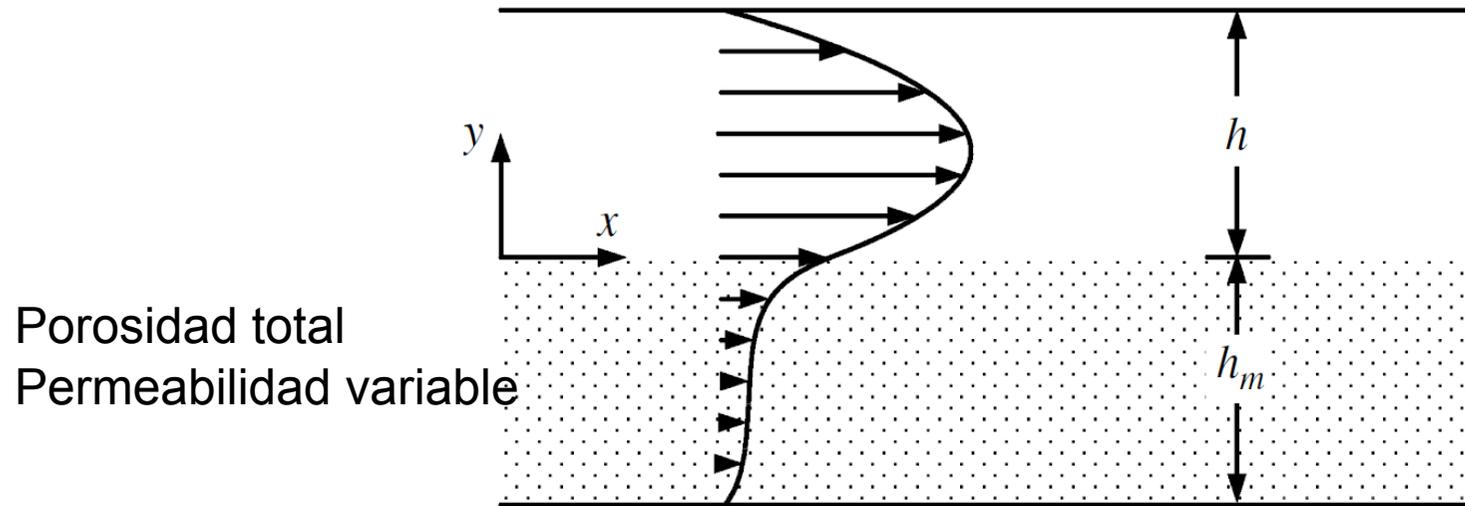
Estructuras en la frontera de un medio poroso



= ?



Modelo 2D



$$\mathbf{D} = -\frac{\mu \mathbf{u}}{\kappa}$$

$$\sigma = \frac{h}{\sqrt{\kappa}}$$

$$\mathbf{u} = (U + u, v)^T$$

$$u = \phi'(y) e^{i(kx - \omega t)}$$

$$v = \psi(y) e^{i(kx - \omega t)}$$

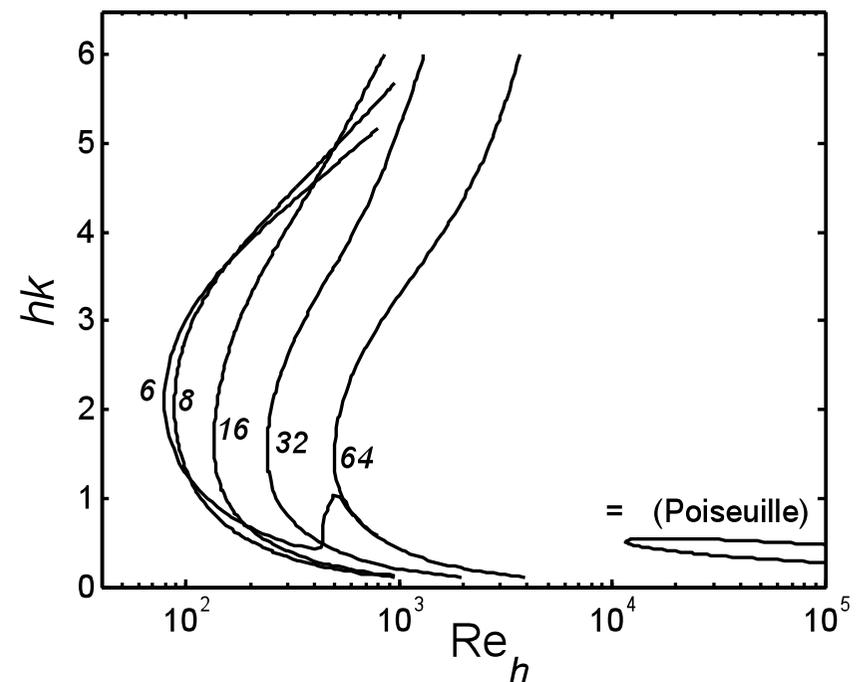
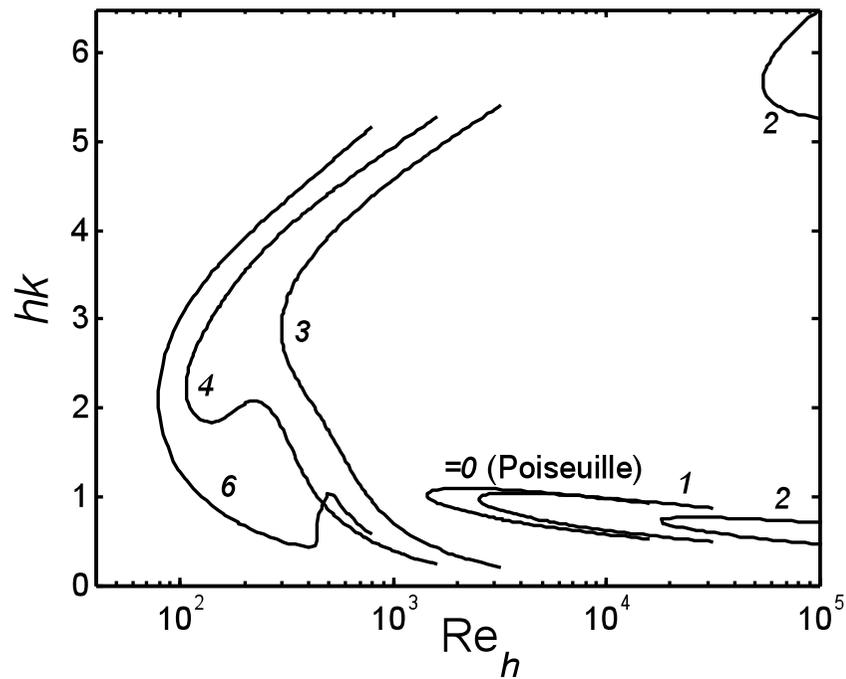
$$p = \varphi(y) e^{i(kx - \omega t)}$$

$$(c - U)(\phi'' - k^2 \phi) + U''\phi = \frac{v}{ik\kappa} [H(y)(\phi'' - k^2 \phi) + H'(y)\phi'] +$$

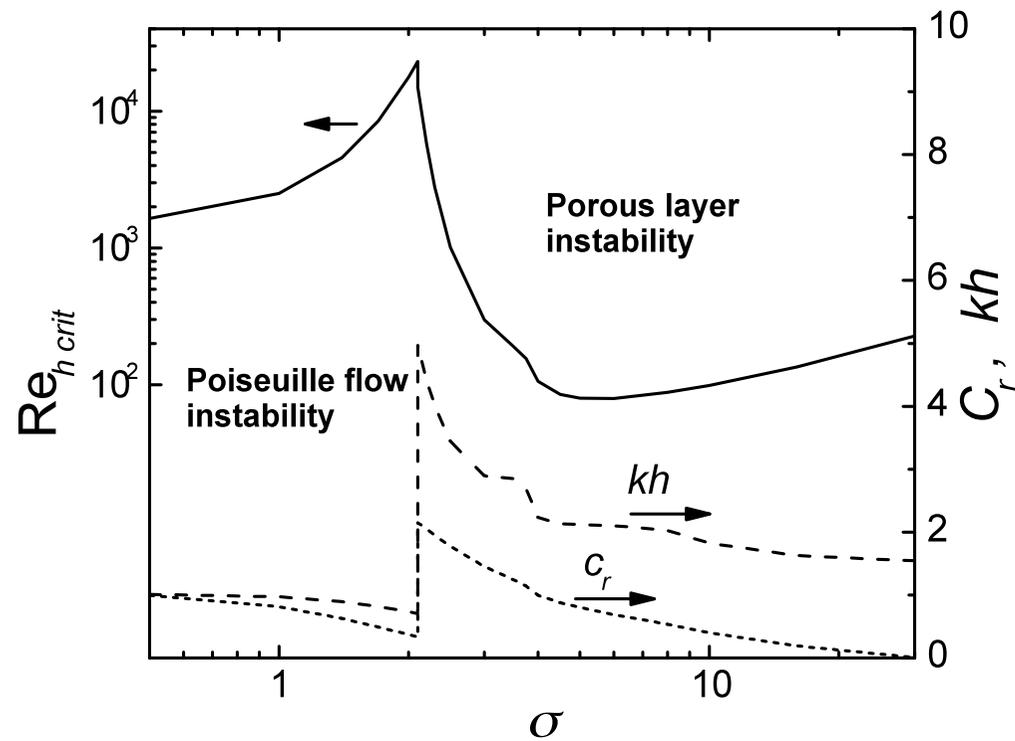
$$\frac{vk}{i}(2\phi'' - k^2 \phi - \phi''')$$

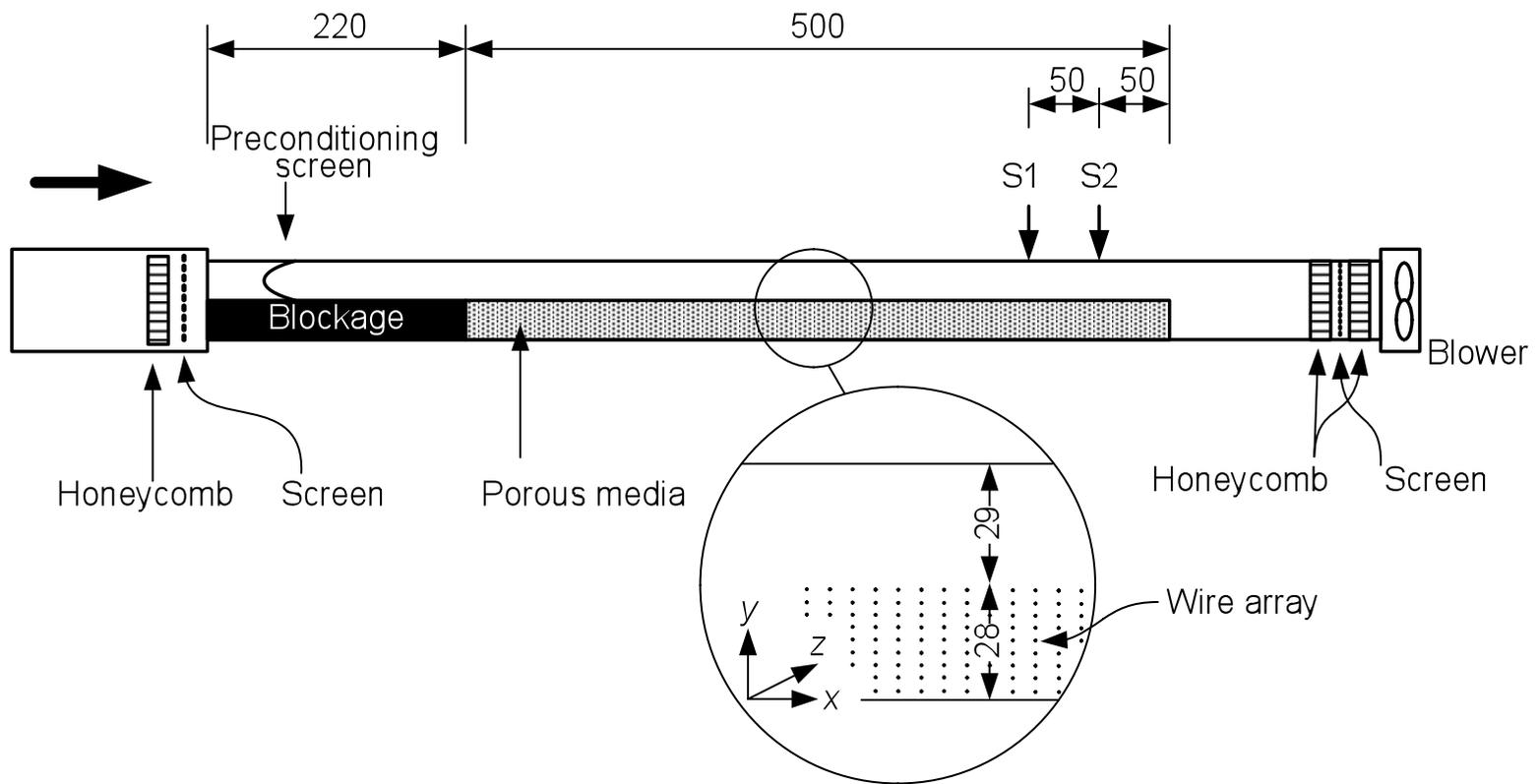
Curvas de estabilidad neutra

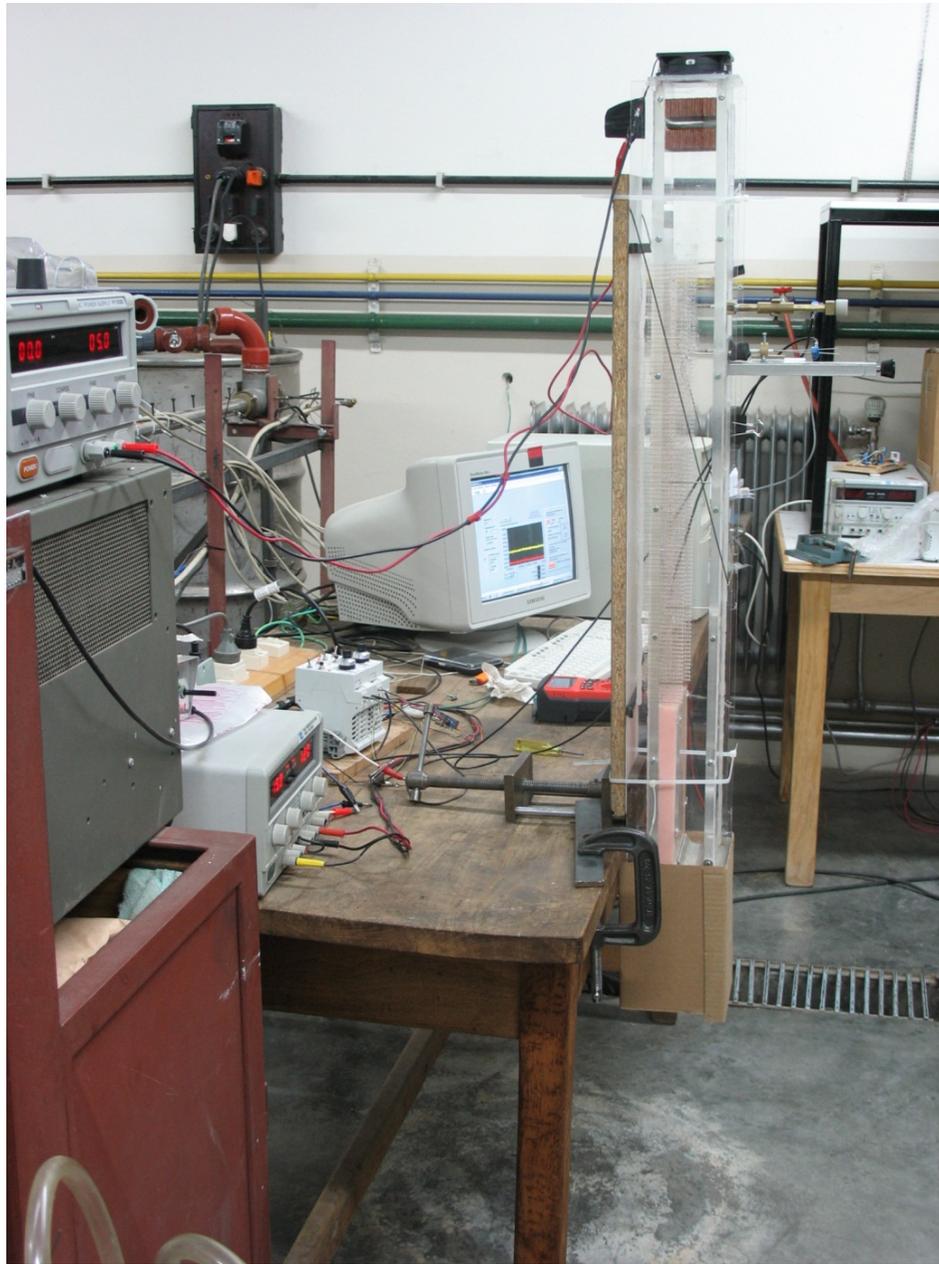
- Caso con zona libre igual a zona porosa



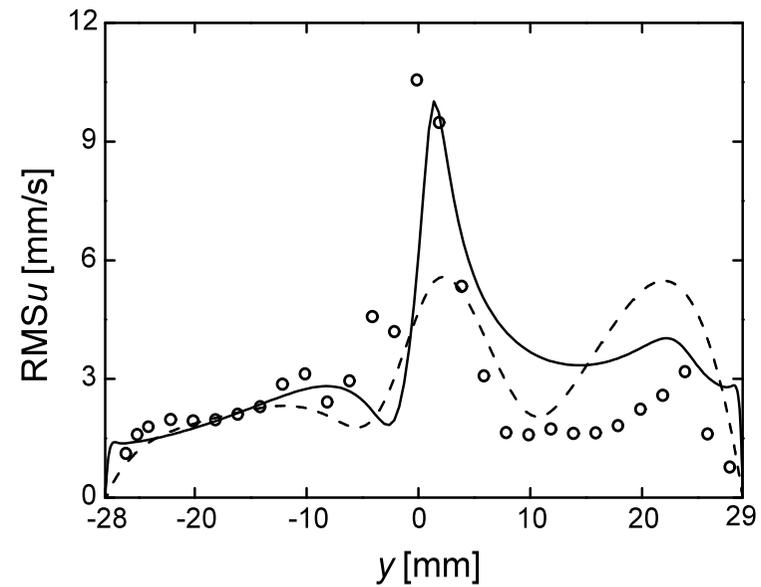
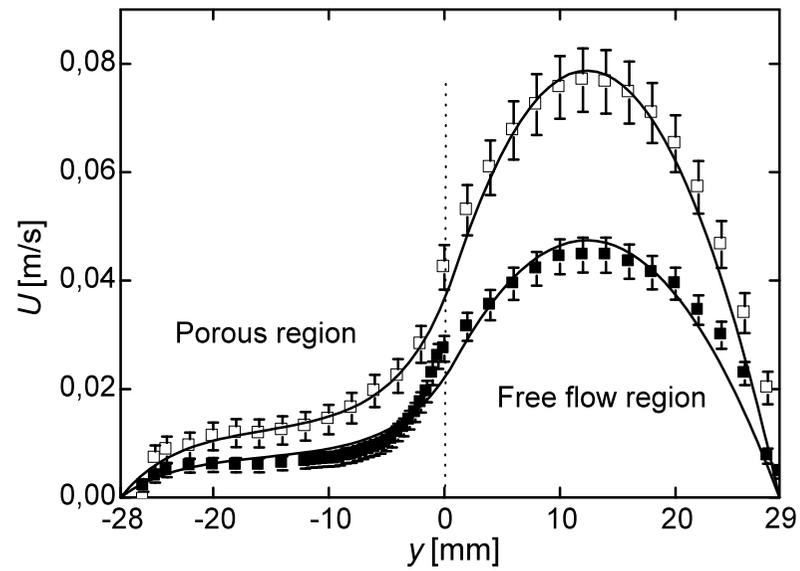
Estabilidad Crítica



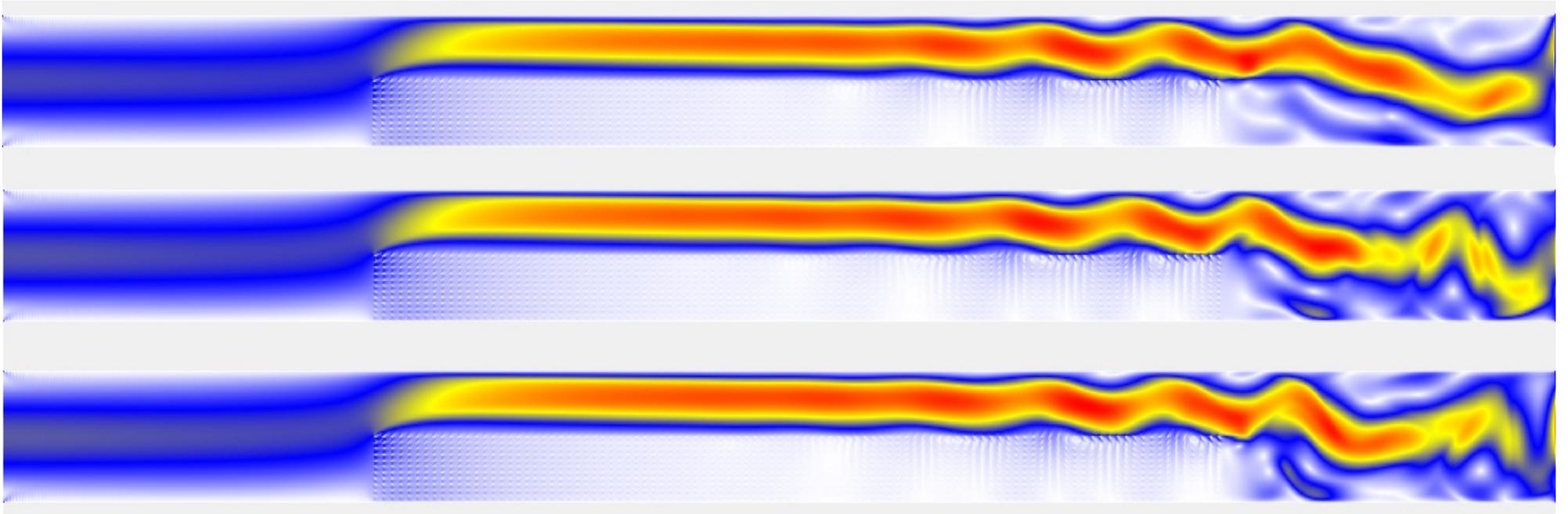




Comparación de resultados



Simulaciones LBM



Gracias!

Preguntas?