

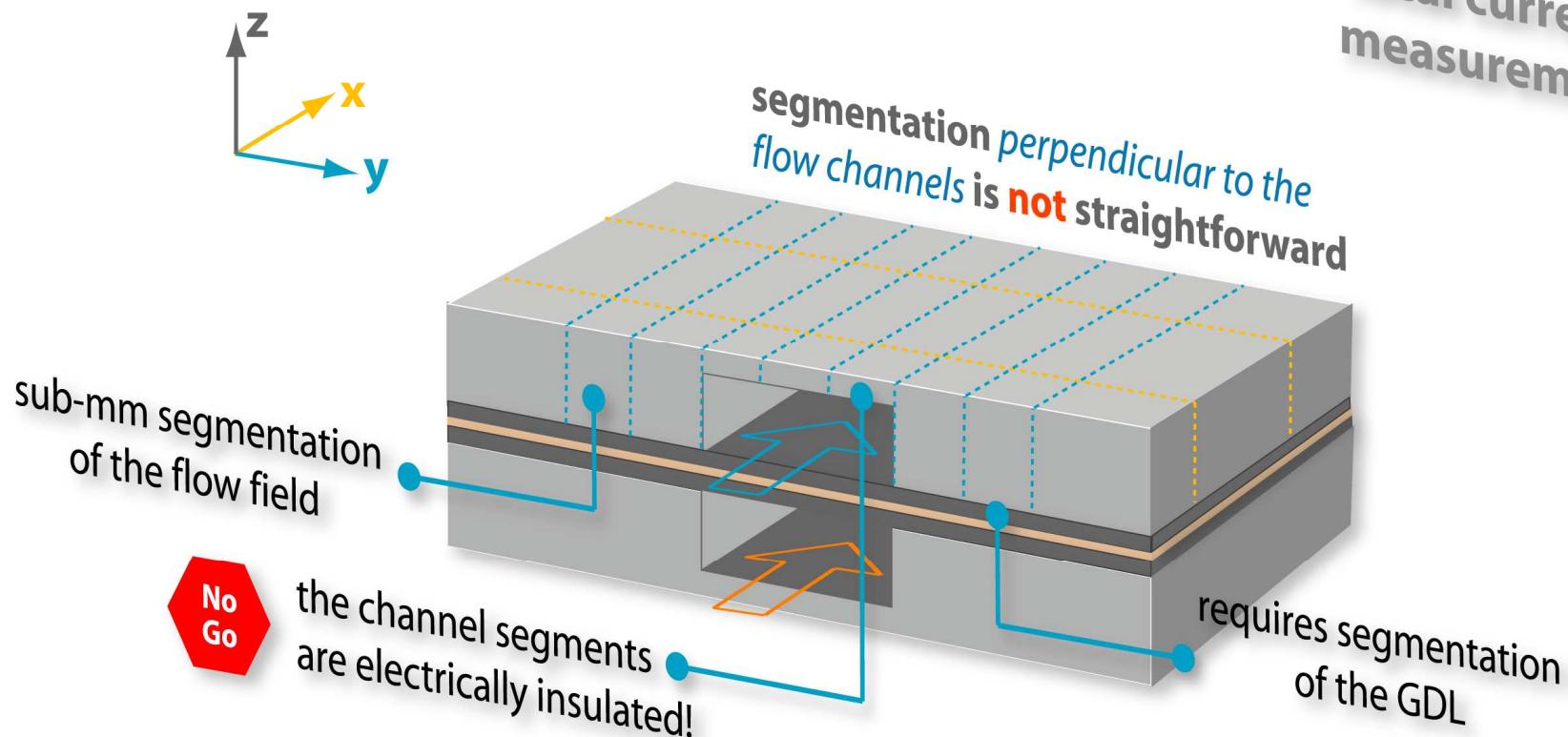
local current measurement in PEFCs

PEFC flow fields induce **inhomogeneities**

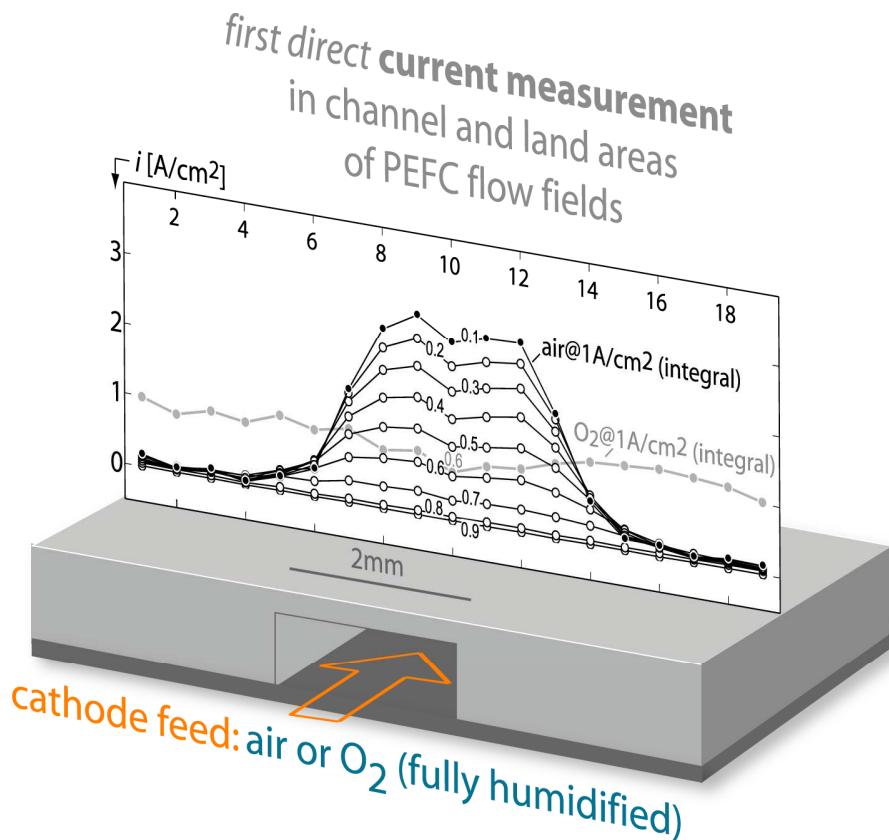
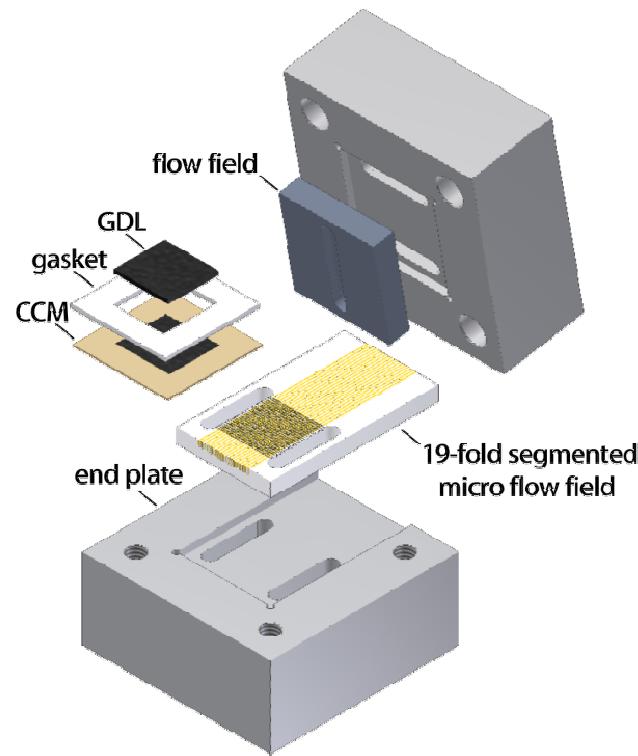
along the flow channel

perpendicular to the flow channel

Evaluation by
local current
measurement

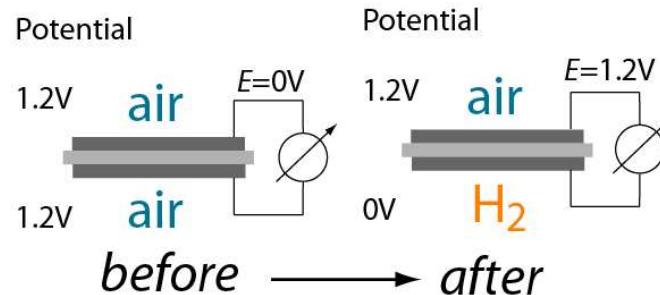


segmented μ -flow field approach



- (1) I.A. Schneider, S. von Dahlen, A. Wokaun, G.G. Scherer, *J. Electrochem. Soc.* accepted for publication (2009).
- (2) I.A. Schneider, G.G. Scherer, 'Local transient techniques in polymer electrolyte fuel cell (PEFC) diagnostics' in "Handbook of Fuel Cells", Vol. 6, W. Vielstich, H.A. Gasteiger and H. Yokokawa, Editors, John Wiley & Sons, New York (2009).

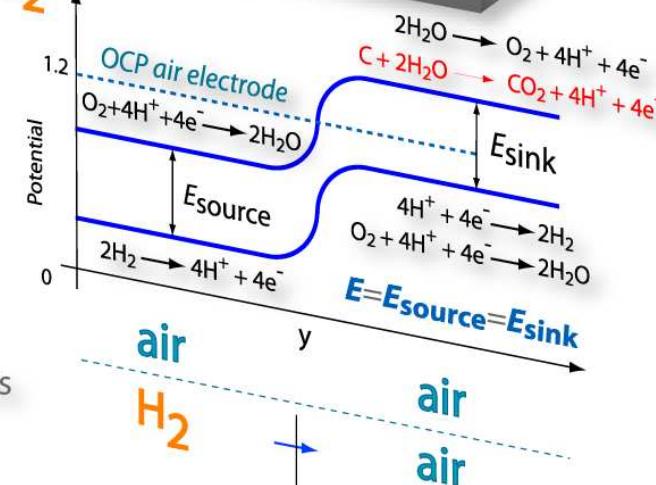
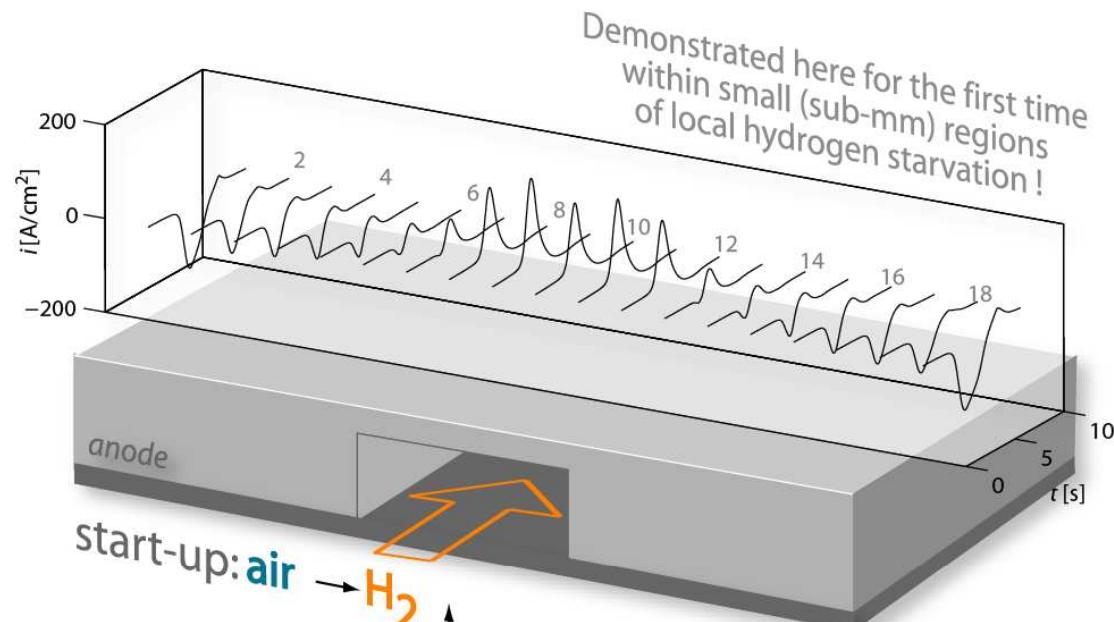
Application I - start-up transient



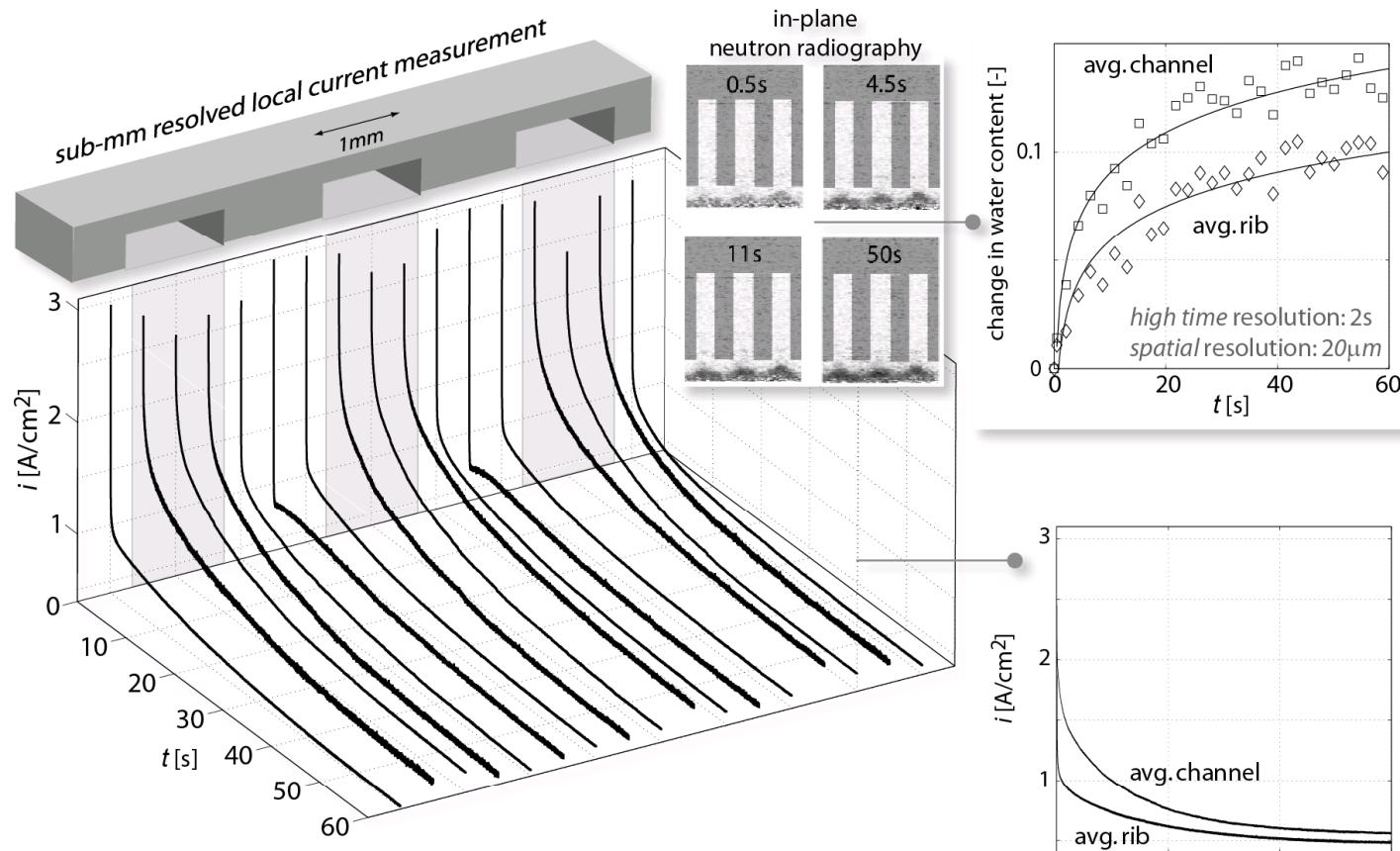
During *start-up* the transition from **air** to **H_2** potential is delayed under the rib .

Since the cell voltage **E** is always equal in channel and rib regions, hydrogen rich parts of the cell (channel) drive a reverse current through hydrogen starved regions (rib) during the transient.

Thereby, the oxygen electrode is *temporarily exposed* to high potentials and prone to **carbon corrosion** and Pt dissolution.



Application II - flooding transient



For the first time *in-plane* neutron radiography and *sub-mm resolved* local current measurement have been used simultaneously in the area of channel and lands of an operating PEFC

The time constant for GDL flooding could be determined to be of the order of $\tau=60s$

The same time constant is observed in the respective current transients

Though the average increase in GDL water content is smaller under the rib the local cell performance is always lower during the flooding period

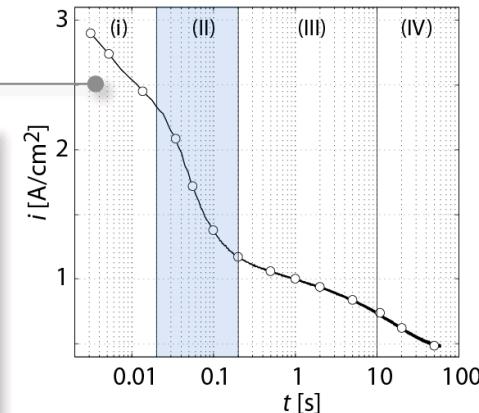
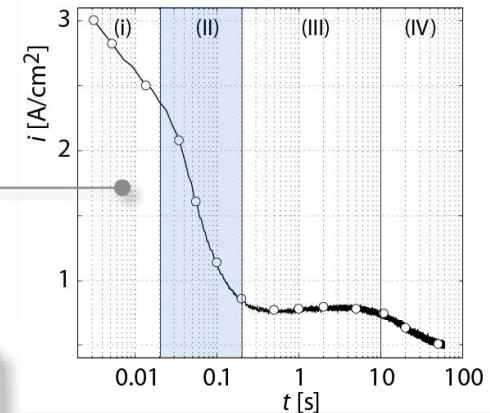
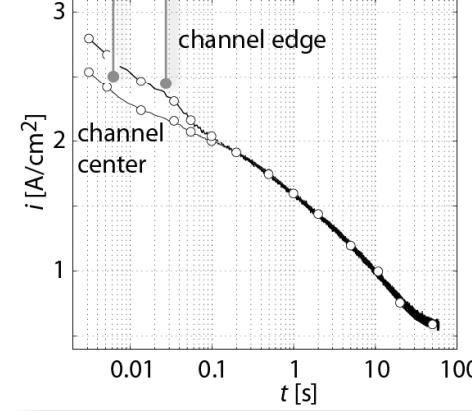
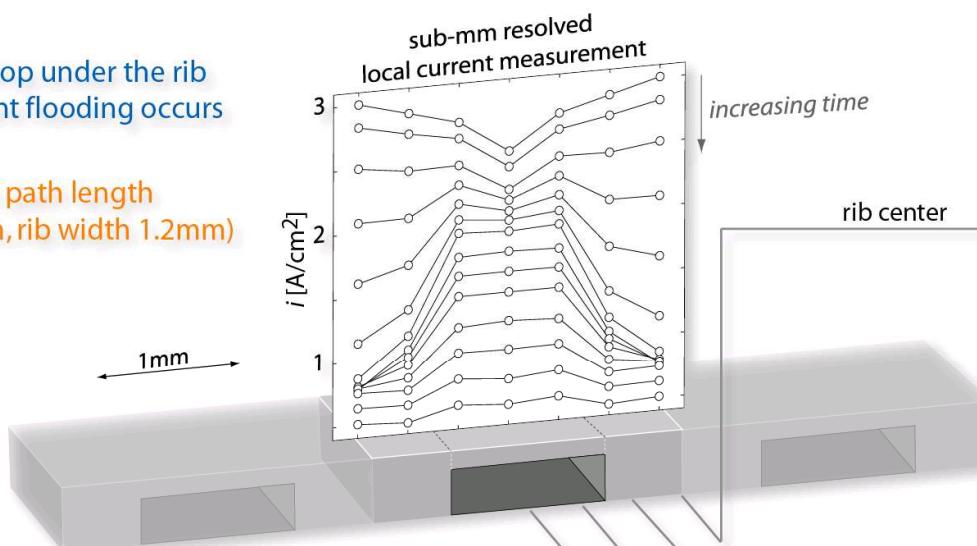
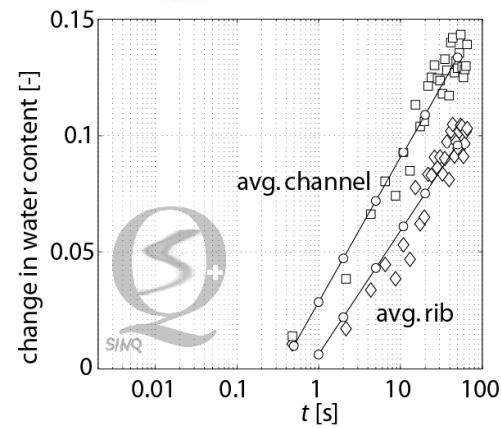
voltage step response: OCV \mapsto 0.1V

Application II - flooding transient

Strong performance drop under the rib already before significant flooding occurs

higher diffusion path length
(GDL thickness 0.2mm, rib width 1.2mm)

1mm



voltage step response: OCV \mapsto 0.1V