# *Current and future applications of grid computing at the 3.0 Tesla research facility*

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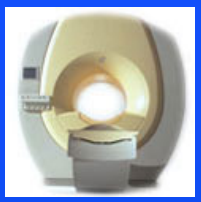
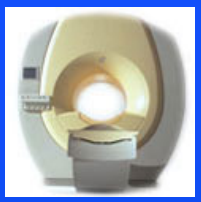


# *Outline*

- 3.0 Tesla research: facts and figures
- Current grid-related projects
- New application areas



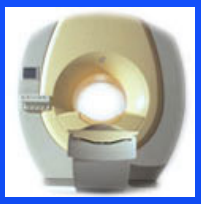
# *Team at AMC*

Ard den Heeten, Kees Grimbergen

Sandra van den Berg, Raschel Snoeks

Erik Akkerman, Cristina Lavini, Aart Nederveen

Dick Veltman, Frans Vos, Silvia Olabarriaga, Jeroen Snel, Matthan Caan, Johan Alkemade, Johan van der Meer

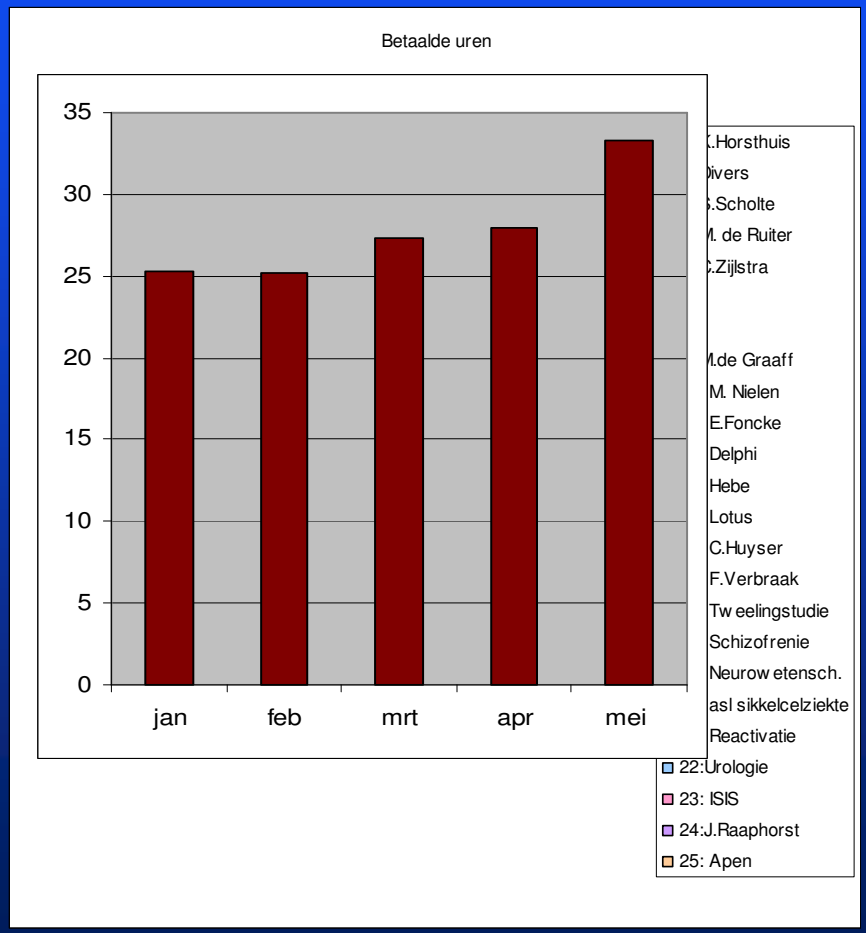


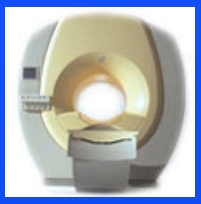
# *Research projects at 3.0 Tesla*

- 30 research projects:
  - ~10 clinical users from AMC
  - ~20 fMRI research projects from University of Amsterdam, Free University and Dutch Cancer Institute
- User meetings organised every two months

# 3.0 Tesla Occupancy

- This year per week: 36 hour clinic and 25 hours research
- Research hours doubled compared to 2005.





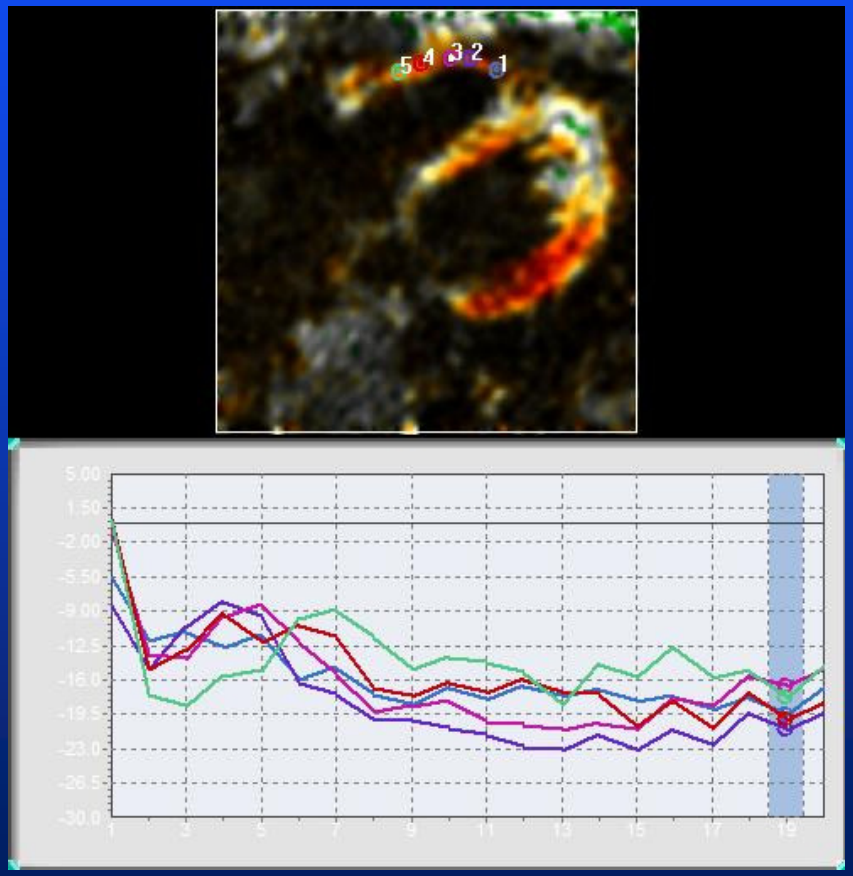
# *Equipment*

- Stimulus setup
- Eye tracker
- EEG/EMG system
- Microscopy coil

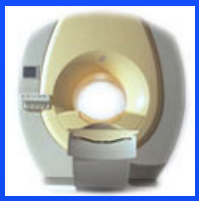
- Major upgrade scheduled: freewave + new gradients (nov/dec 2006)

# *Clinical partners in AMC*

- Cardiology (SENC)
- Urology (DCE MRI)
- Haematology (ASL)
- Neurology (MRS, fMRI)
- Vascular Medicine (MRS, STAiRS)
- Radiology (abdomen, neuro, wrist)



# *Clinical partners in AMC*



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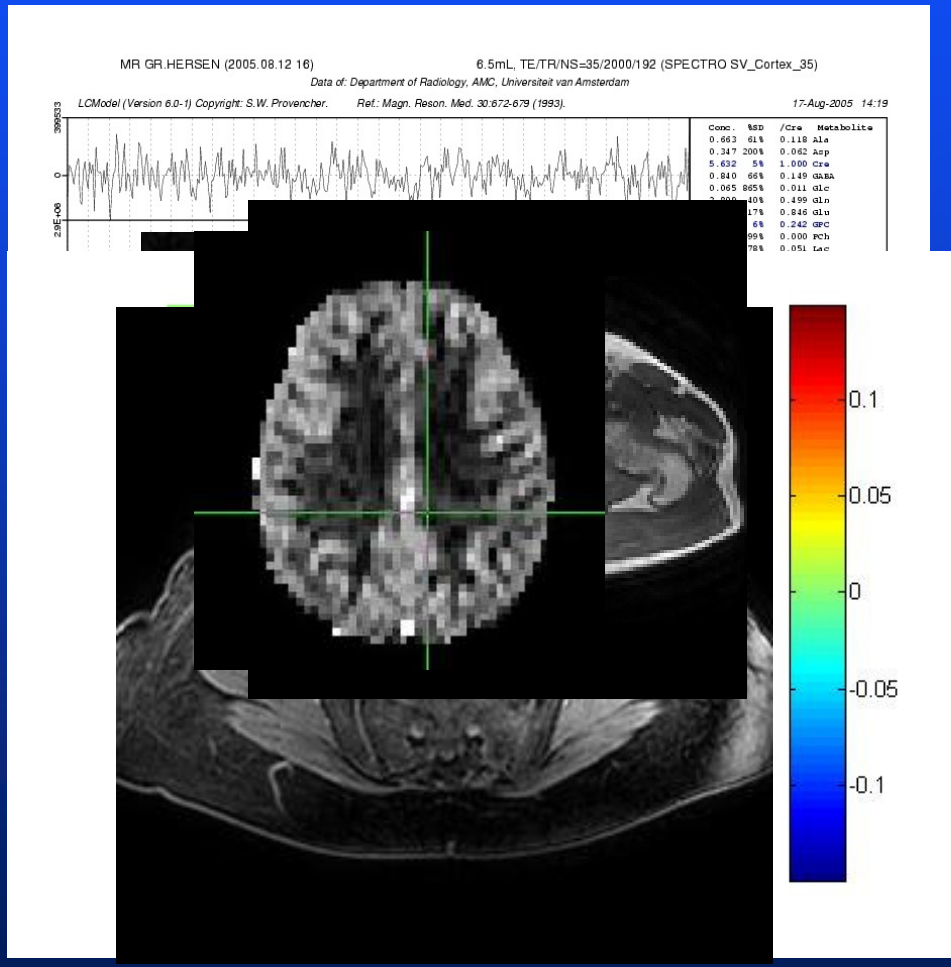
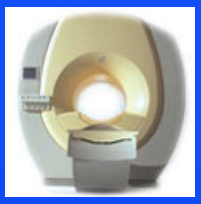
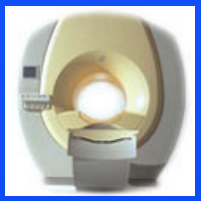




# *Current grid-related research*

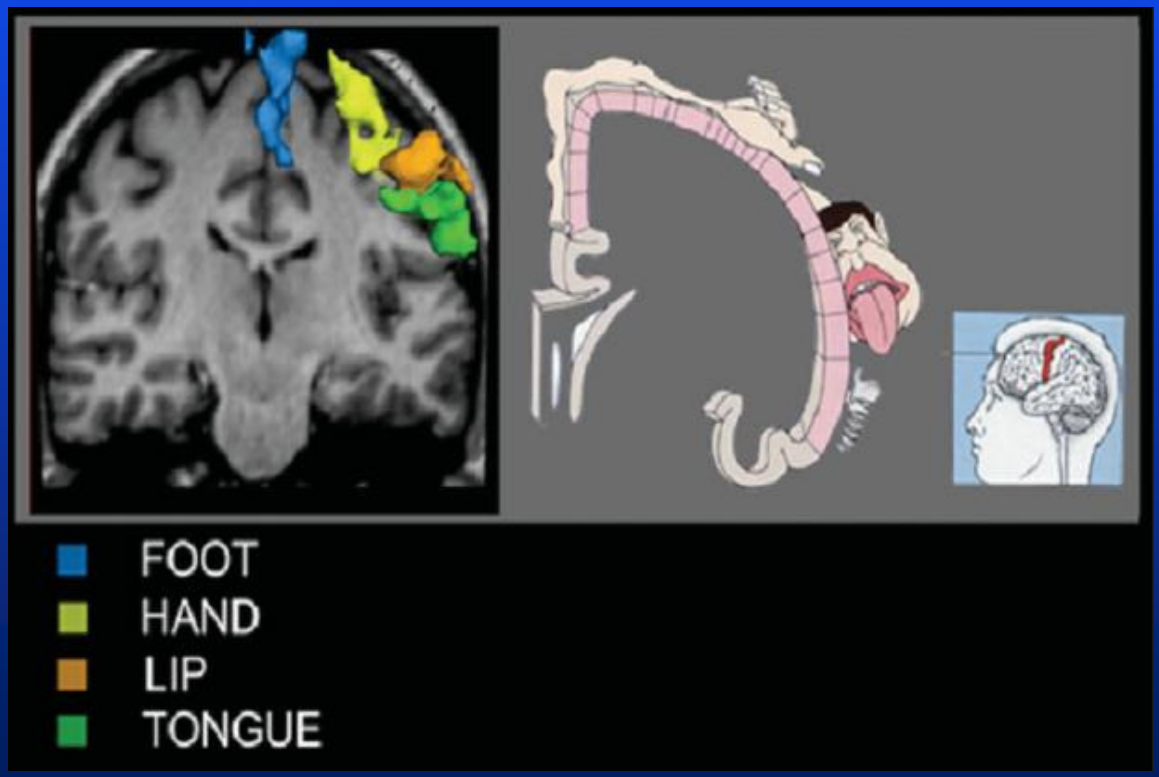
- HAFT
- Clinical fMRI
- Parameter sweep using Nimrod



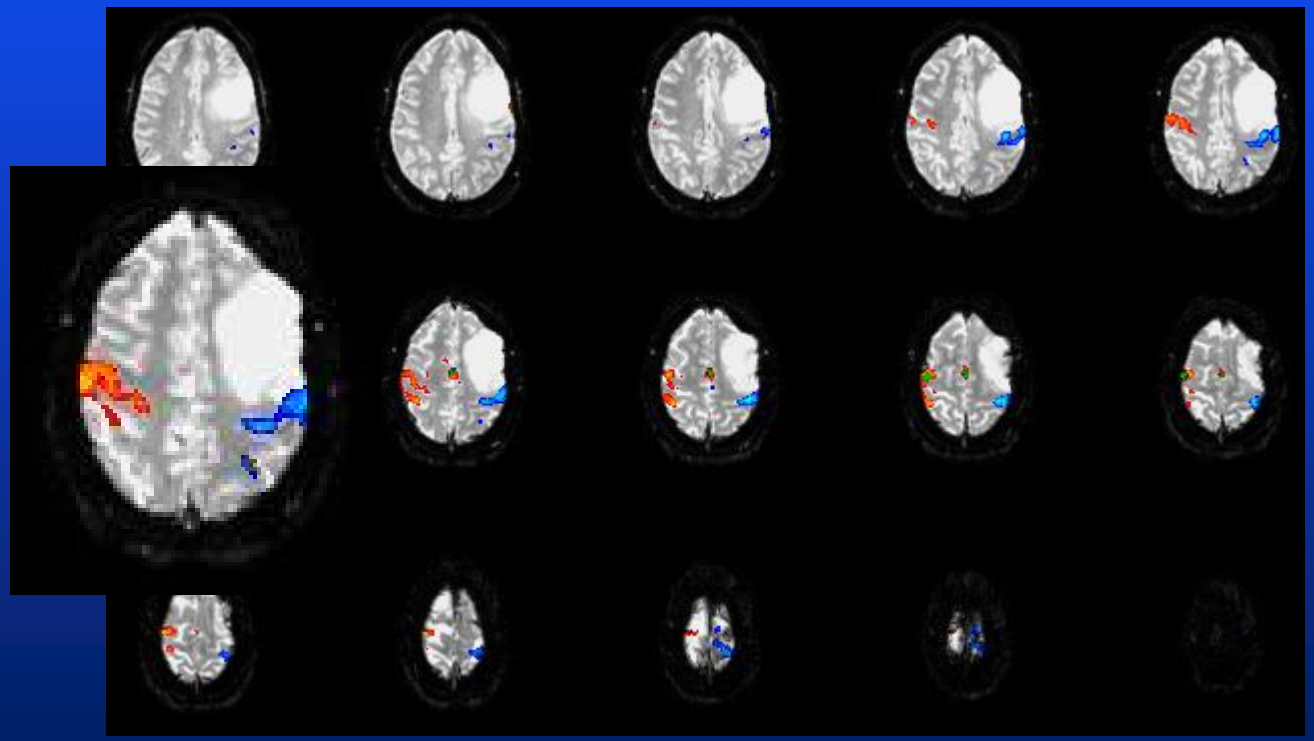
# *Paradigms in clinical fMRI*

- Visual cortex
- Motor cortex
- Language regions: Broca and Wernicke

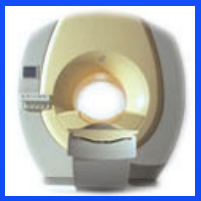
Primary motor cortex



# *Clinical fMRI: hands*

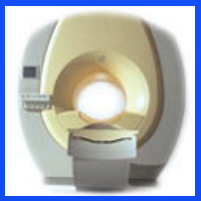


# *Workflow for clinical fMRI at AMC*

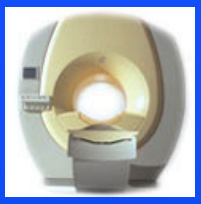


- Results available at GRID server in AMC for both radiologists and neurosurgeons
- Results within 1 hour: scan can be repeated

# *Use of Nimrod for parameter sweep*

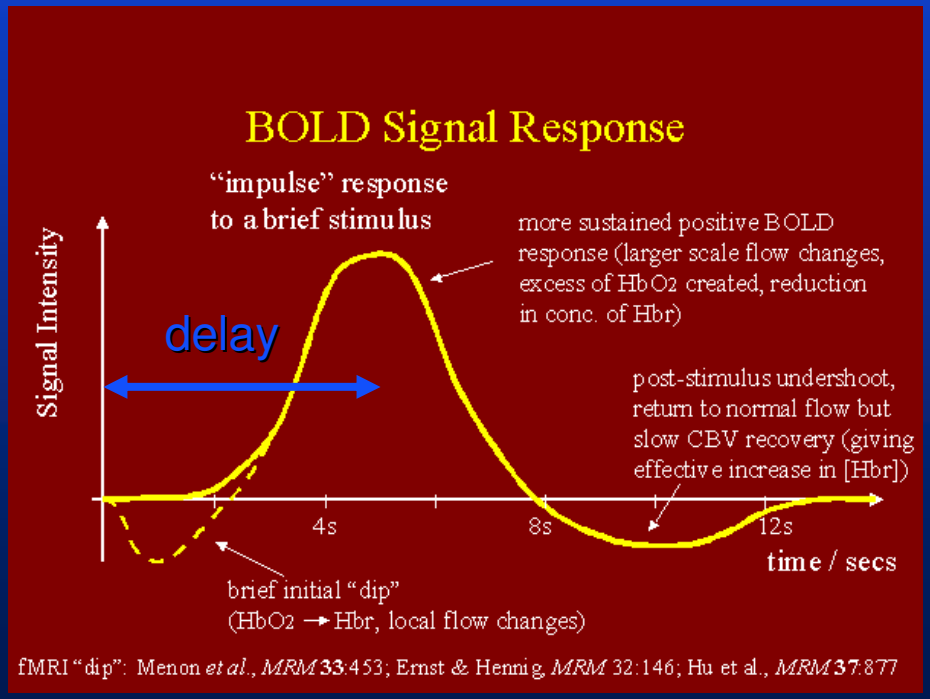


- Situation now: fine tuning of parameters in fMRI is time consuming and often impossible
- Desired situation: parameters can be optimised by using grid-computing
- For example: delay HRF, FWHM smoothing, registration

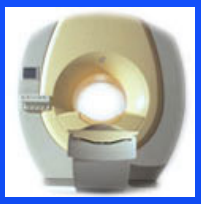


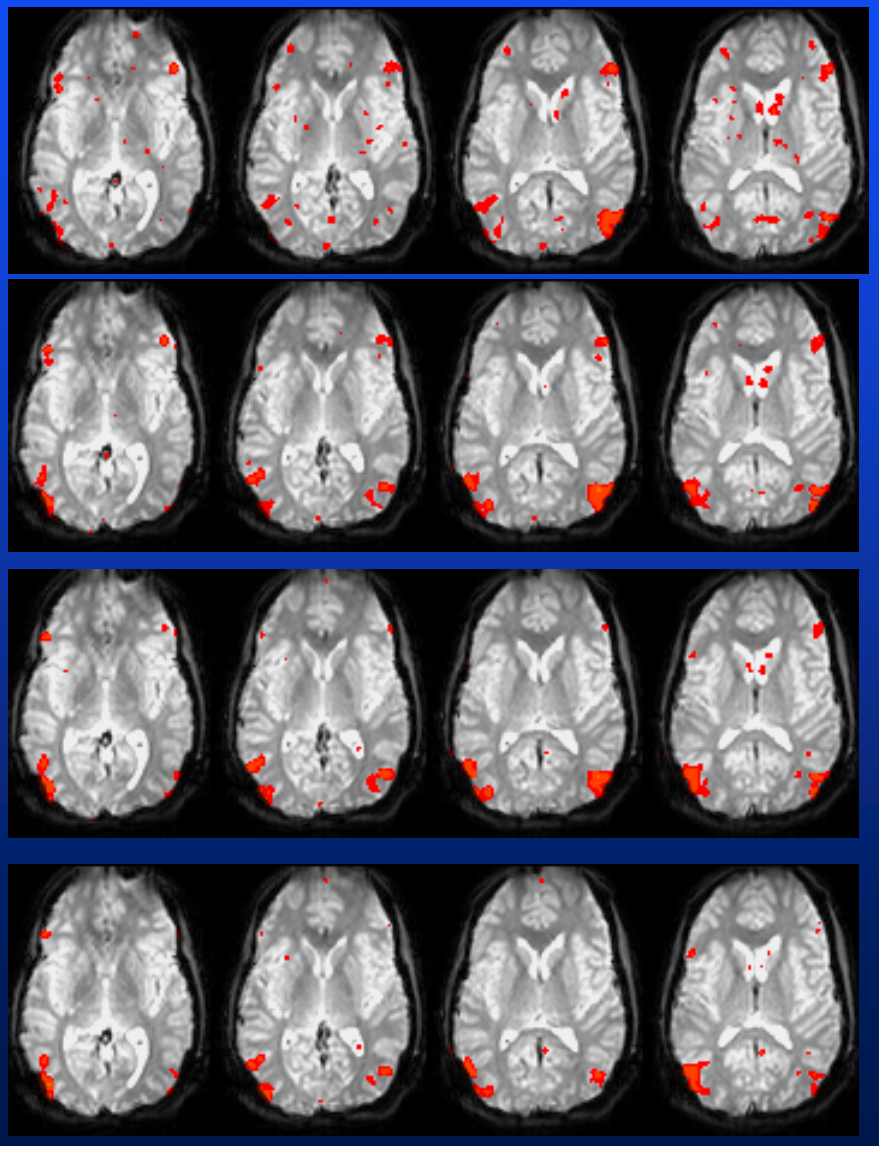
# *Parameter sweep example*

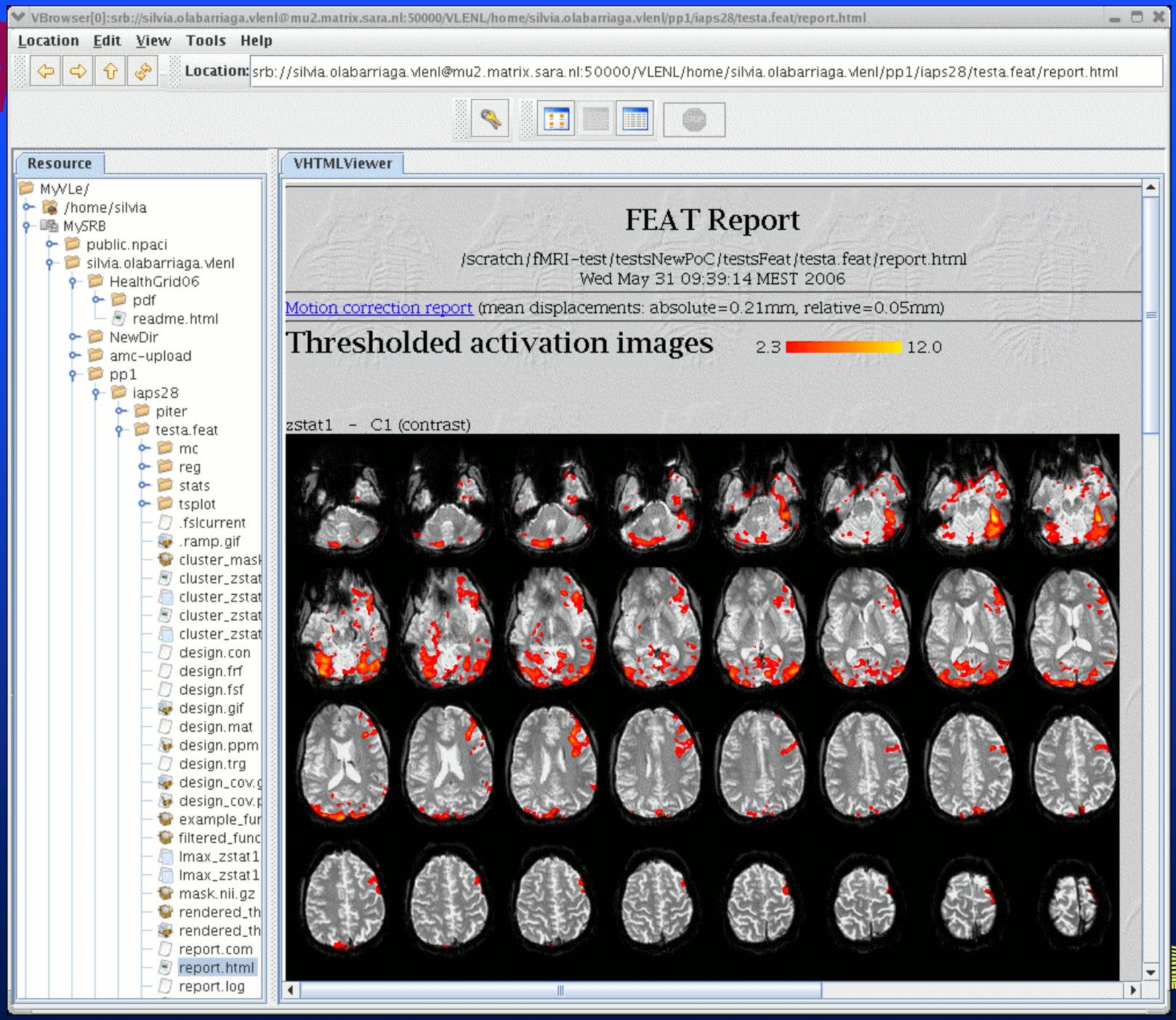
- Variation of delay in HRF will yield different activation patterns
- t-value in specific ROI can be used as cost function.




# *Parameter sweep for HRF*



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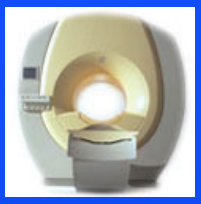
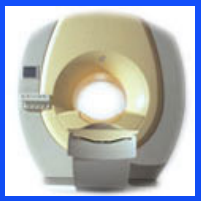
Wed May 31 09:39:14 MEST 2006
Motion correction report (mean displacements: absolute=0.21mm, relative=0.05mm)
Thresholded activation images
2.3
12.0
zstat1 - C1 (contrast)



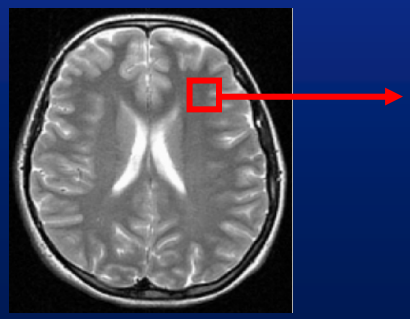
# *New Application Areas*

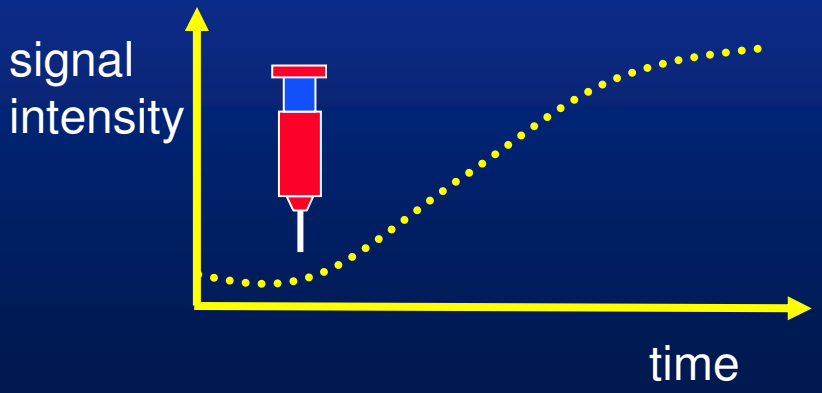
- DCE MRI
- Carotid wall measurement
- MR colonoscopy

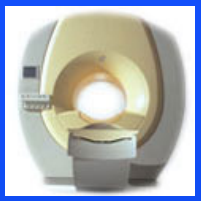
# *Dynamic Contrast Enhanced MRI*



- Increasingly common MR imaging technique, often used to help diagnosis in tumours and differentiate malignacy.
- Consist of a dynamic scan, where many short scans in succession are performed while a contrast agent is injected.



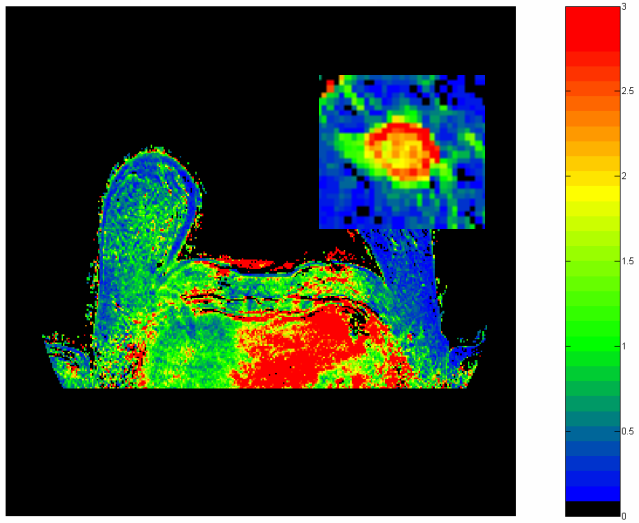




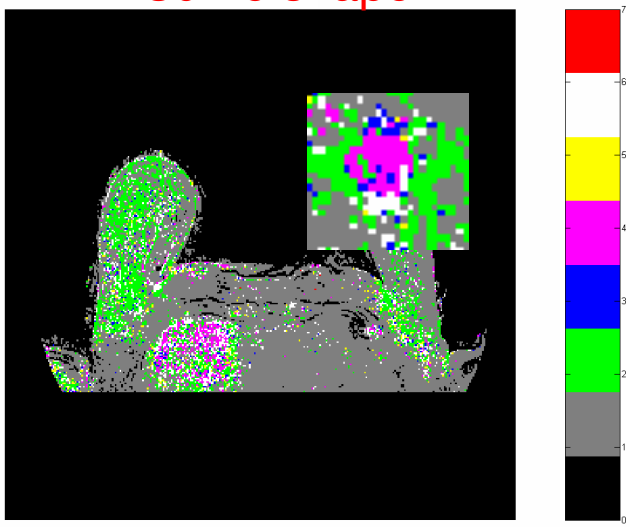
# *Qualitatitve DCE*

- Enhancement curves show typical patterns.
- Patterns have been described in the literature and correlation has been made with pathology.

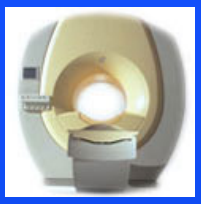
Maximum enhancement

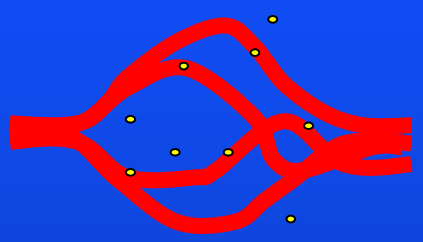


Curve shape

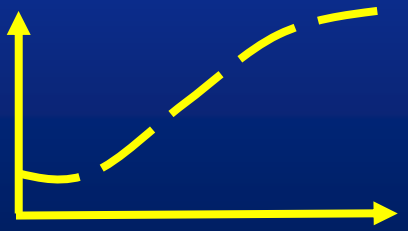


# *Quantitative DCE MRI: pharmacokinetic modelling*

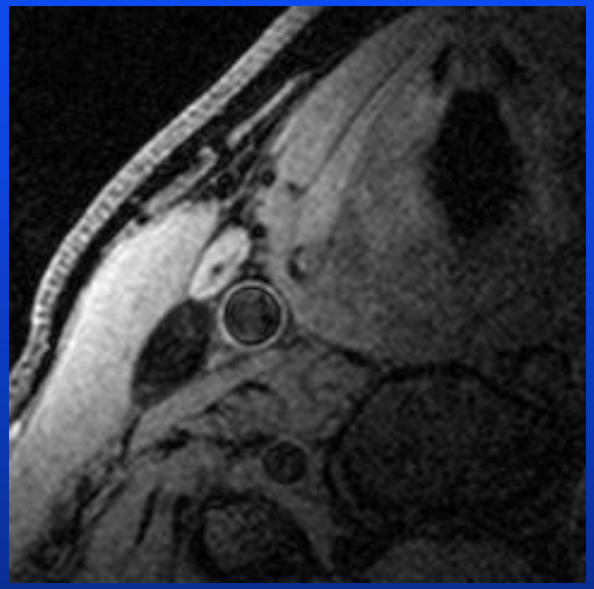


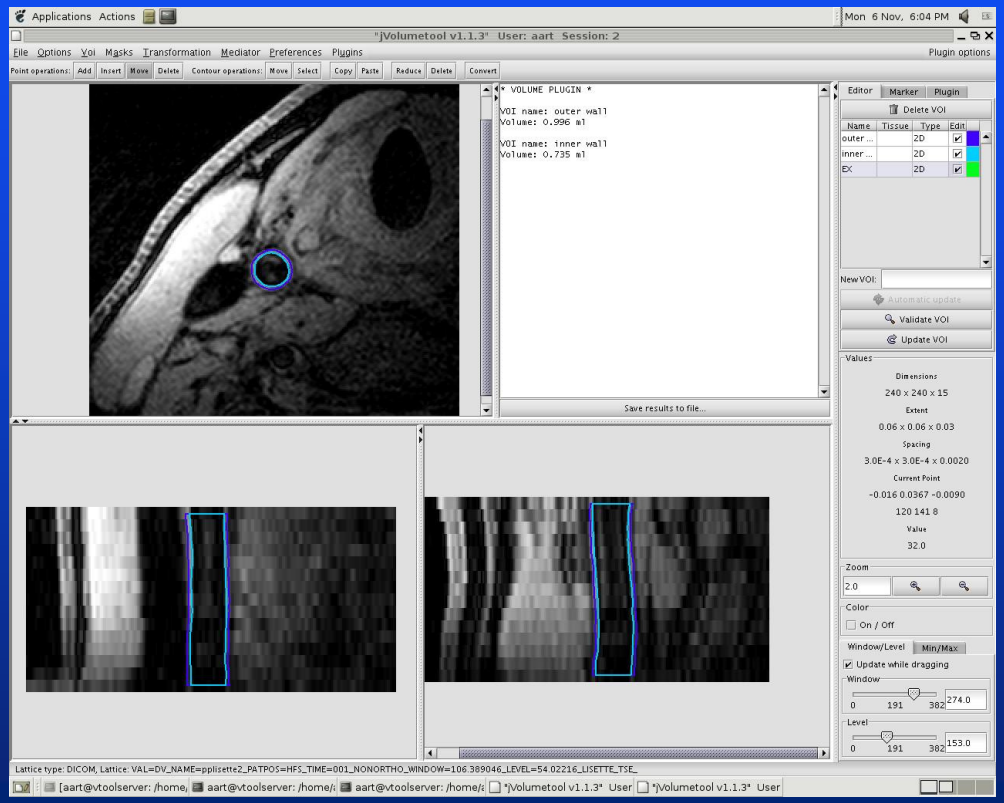


- Proposed in order to “standardise” results, even if acquired with different protocols
- The idea is to measure physiologic parameters, not MRI parameters!
- A model is made to try and correlate what we see in a dynamic scan, and what happens locally in the tissue.



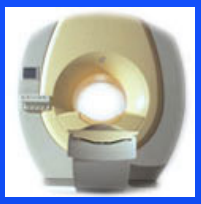
# Carotid wall volume measurement






Assessing vascular remodeling by measuring carotid wall volume

Automated workflow needed (storage, post processing, access to data) in large pharmacological studies



# *Conclusions*

- Both clinical and non-clinical users at 3.0 Tesla MRI scanner
- Current projects highlight benefit of grid computing in both areas
- Several new application areas are coming up.