IMAGERIE & STRATÉGIES
THÉRAPEUTIQUES DES PATHOLOGIES
CÉRÉBRALES & TUMORALES

Cyceron
PLATEFORME D'IMAGERIE BIOMÉDICALE

StO_2-MRI sensitively images hypoxia in the brain: validation in both ischemic and tumoral situations

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Grenoble
Institut Neurosciences

Équipe "Neuroimagerie Fonctionnelle et Perfusion Cérébrale »
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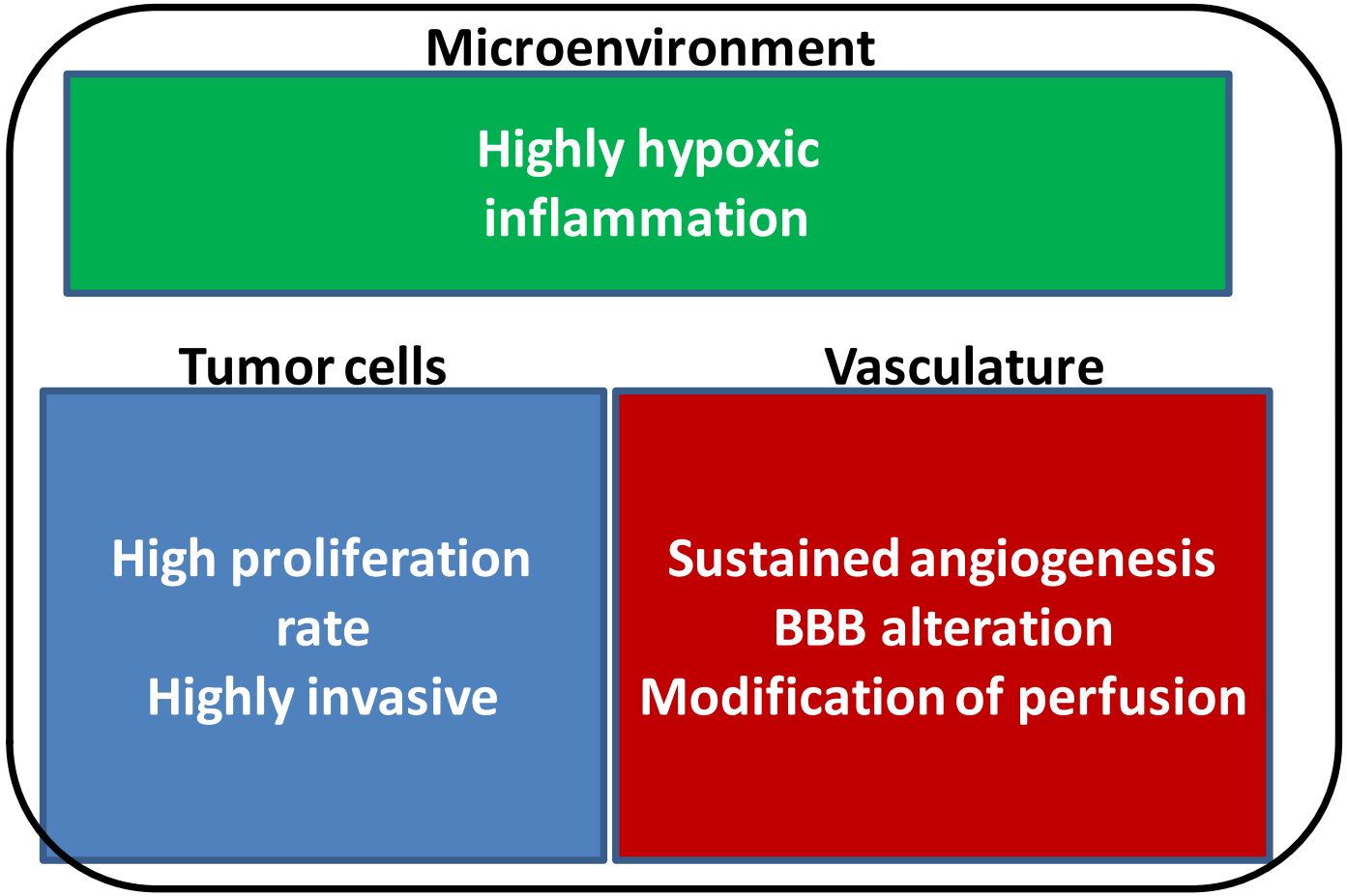
A tumor mass: a multi-compartment model ?



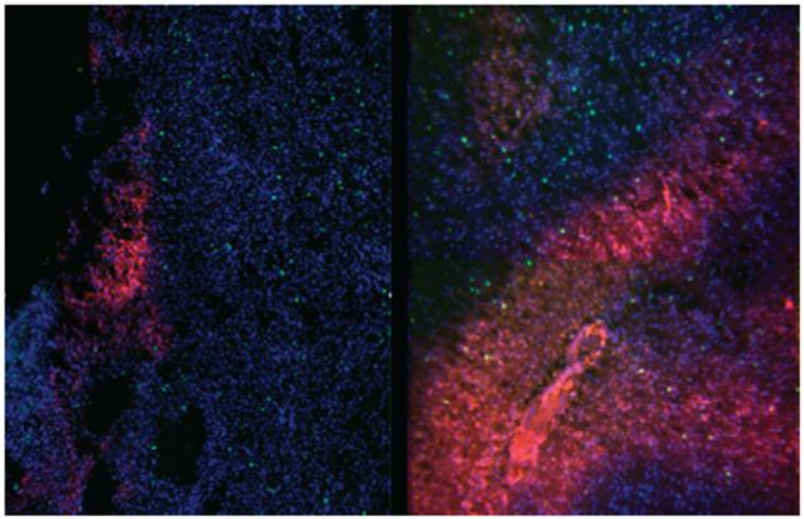
Hypoxia and glioblastoma

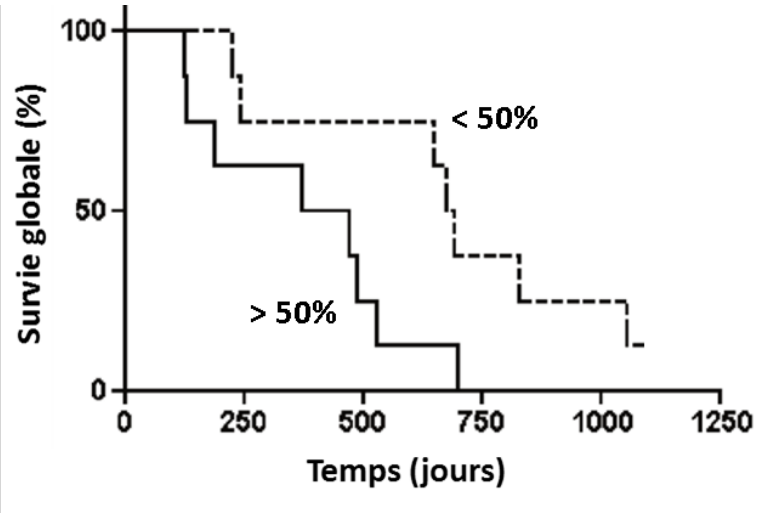
HYPOXIA

- ✓Metabolic adaptation
- ✓Invasion
- ✓Angiogenesis
- ✓Inflammation

- ✓Radioresistance
- ✓Chemoresistance

Poor prognosis

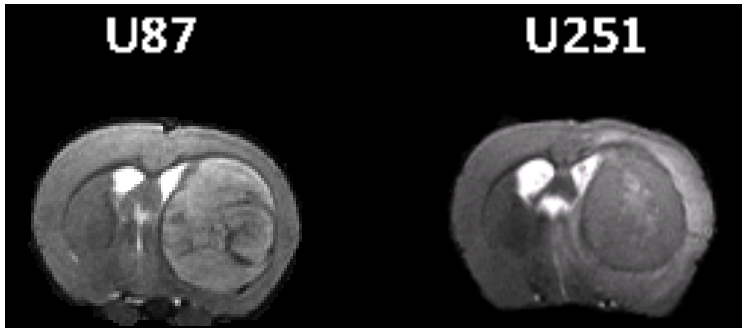


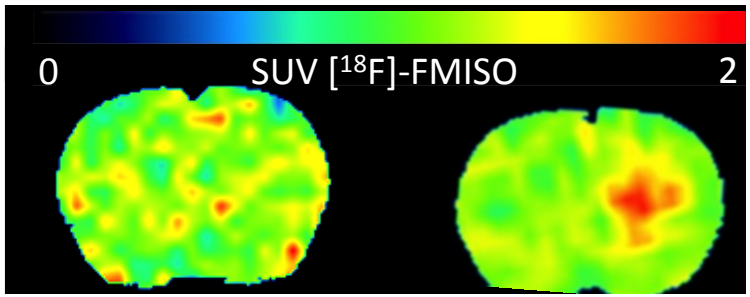


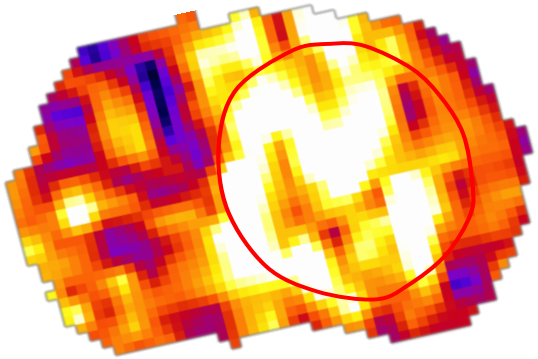
Evans et al., 2010

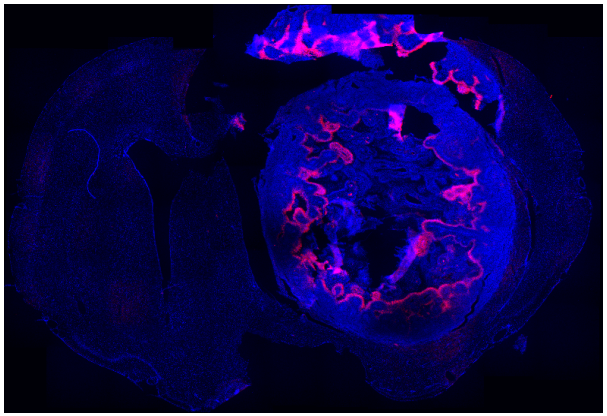
➔ **Detection of hypoxia with imaging ?**

Non invasive detection of hypoxia with FMISO PET







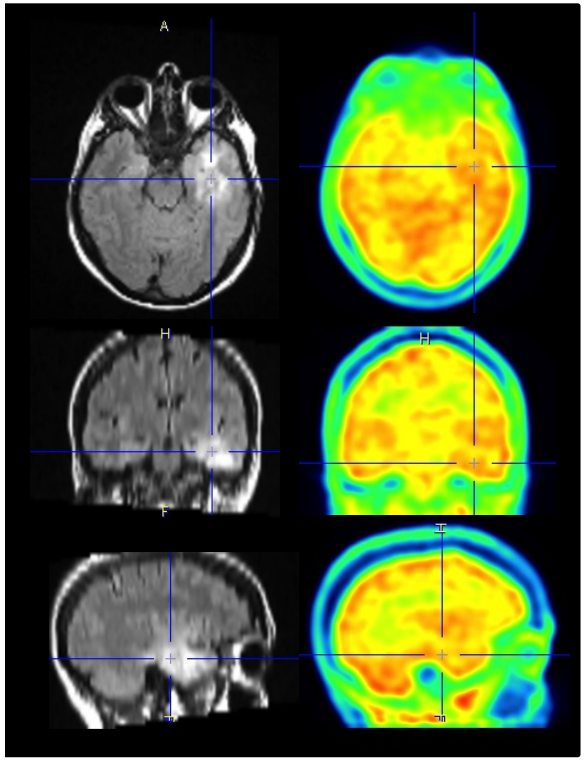


Valable S et al., 2011; CorroyerDulmont et al., 2013

Non invasive detection of hypoxia with FMISO PET

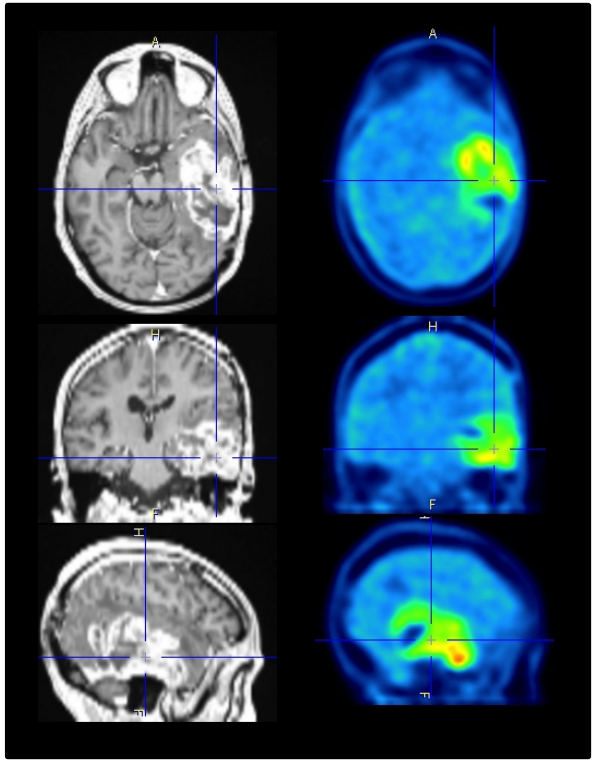
Low grade glioma

FLAIR **[^{18}F]-FMISO PET**



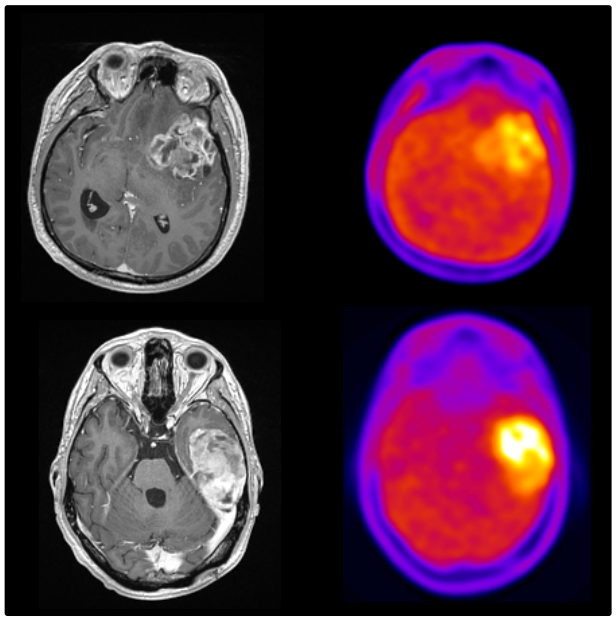
GBM

T1w-Gd **[^{18}F]-FMISO PET**



GBM

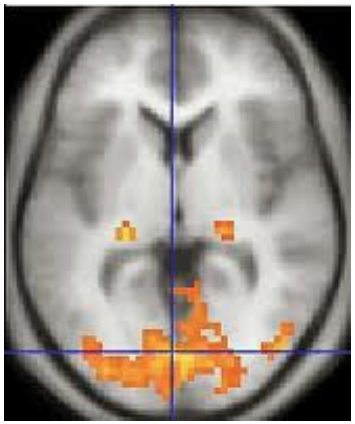
T1w-Gd **[^{18}F]-FMISO PET**



Bekaert et al., EJNMMI 2017
Ponte K et al., JNM 2017
Chakhoyan et al., Sci Rep 2017

HypOnco, coordinateur Pr JS Guillamo, promoteur CHU of Caen

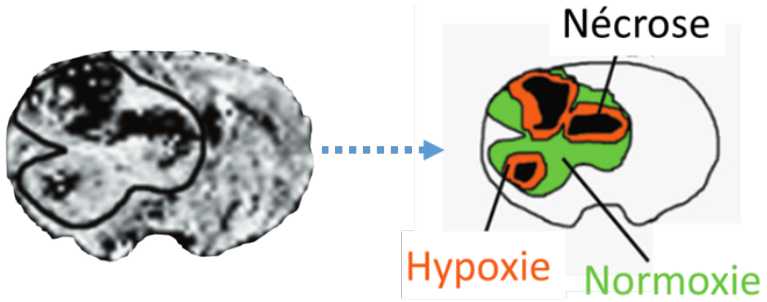
BOLD signal



Reflection of tissue oxygenation?

BOLD signal is influenced by various parameters

- ✓ field inhomogeneities
- ✓ Blood volume
- ✓ T2



Lemasson et *al.* 2012

➔ **Correlation between FMISO PET and StO_2-MRI in a context of GBM ?**

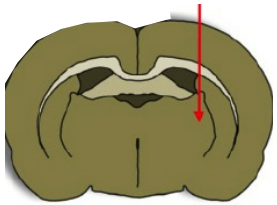
Objectives

Comparison of StO_2-MRI and FMISO PET

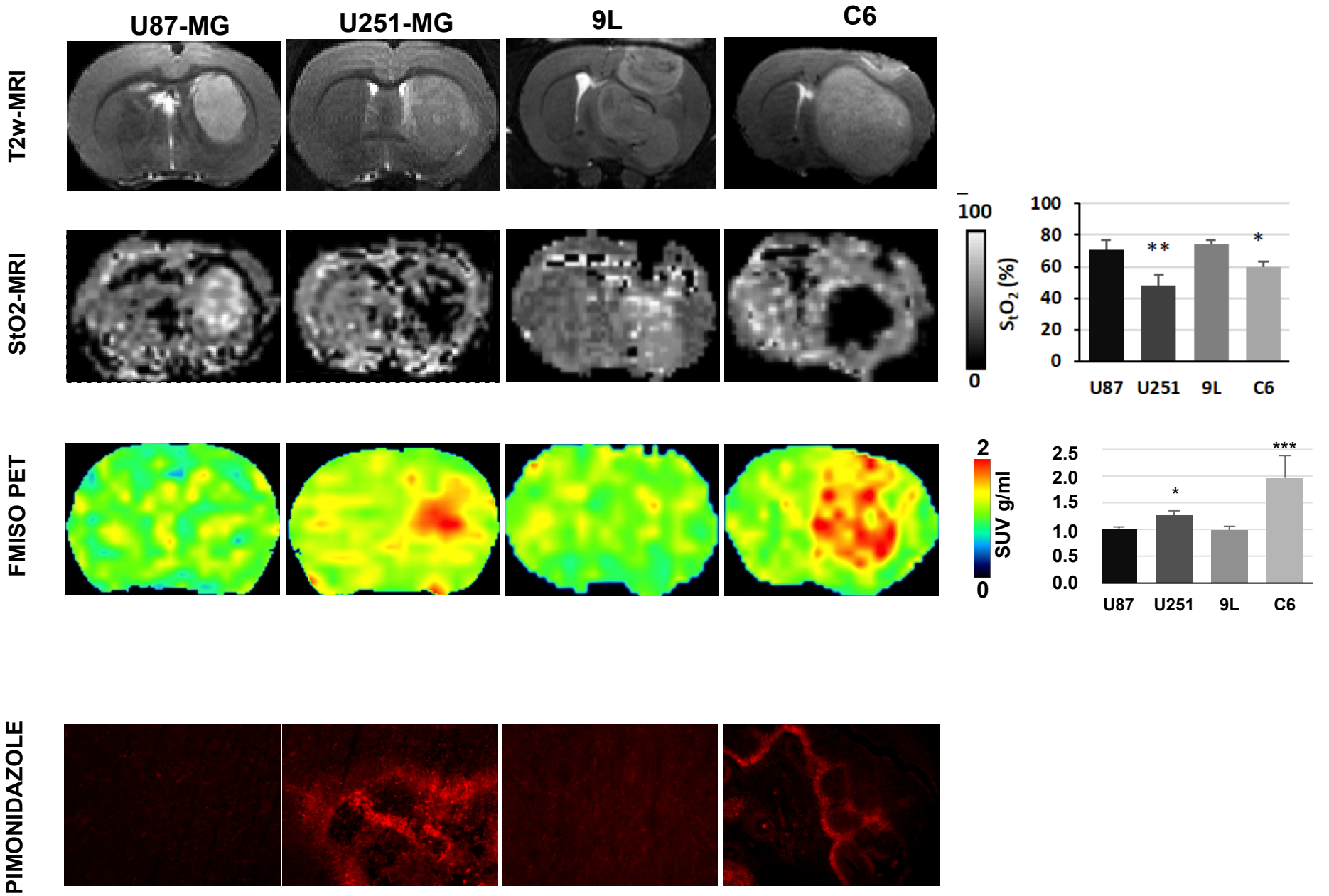
Methods

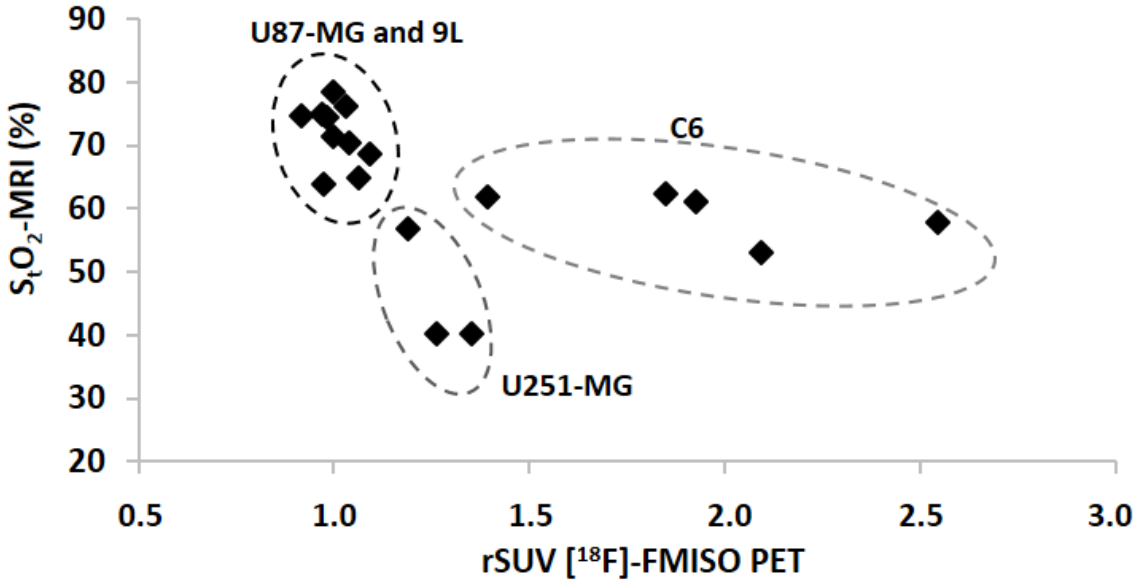
4 GB brain models
(C6, 9L, U87-MG, U251-MG)

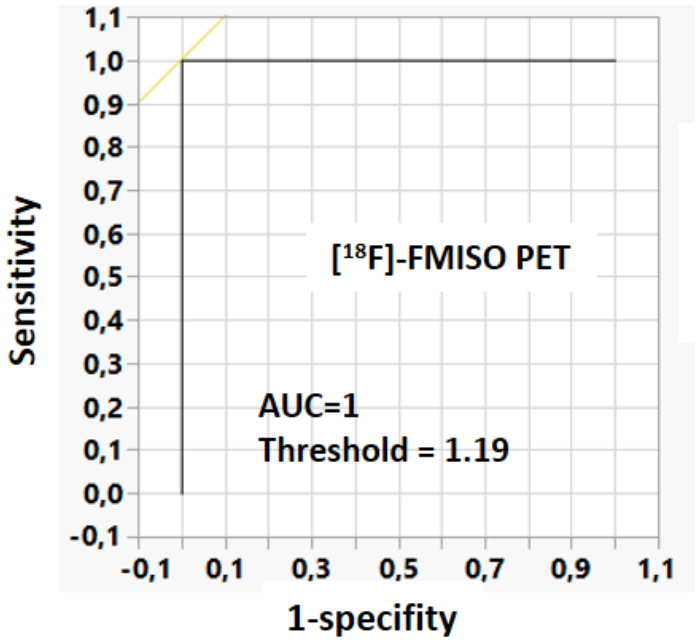
mp MRI → **FMISO PET** → **Histology**

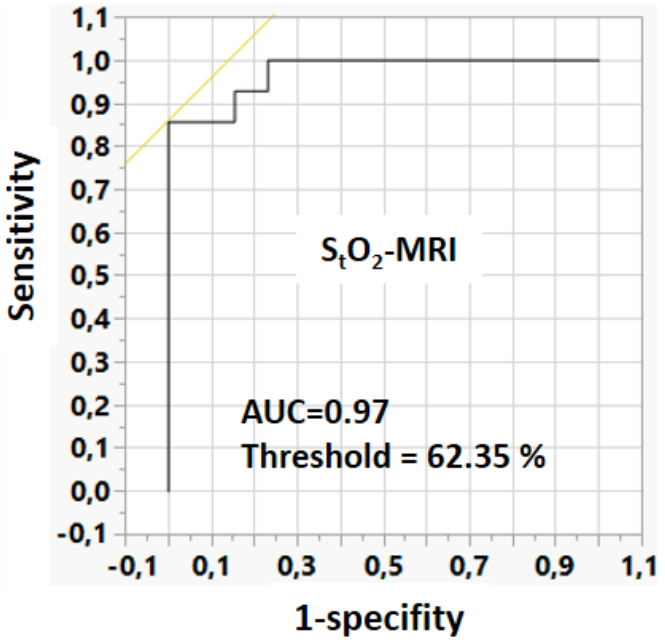


StO2-MRI on various brain tumor models

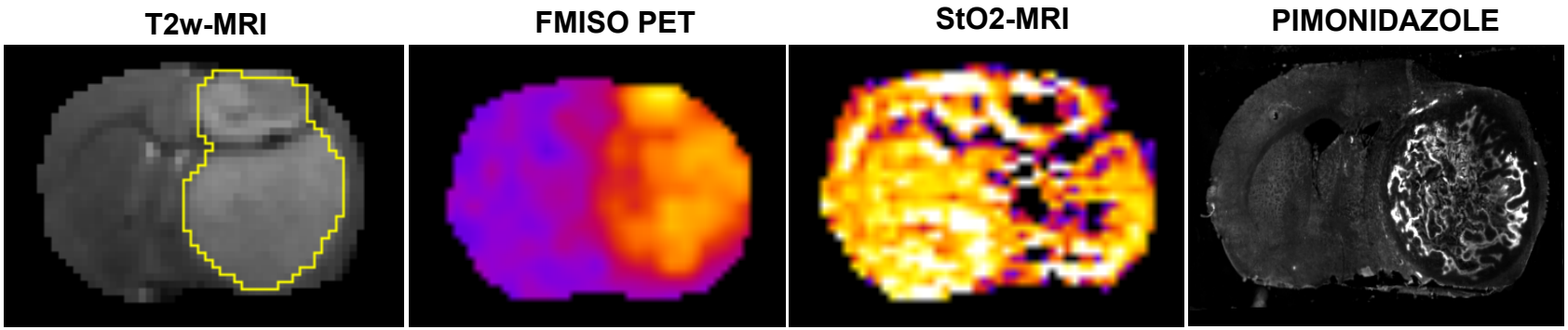



U87-MG and 9L
C6
U251-MG
S_tO_2-MRI (%)
rSUV [^{18}F]-FMISO PET
90
80
70
60
50
40
30
20
0.5
1.0
1.5
2.0
2.5
3.0


[^{18}F]-FMISO PET
AUC=1
Threshold = 1.19
Sensitivity
1-specifity
1,1
1,0
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0,0
-0,1
-0,1
0,1
0,3
0,5
0,7
0,9
1,1


S_tO_2-MRI
AUC=0.97
Threshold = 62.35 %
Sensitivity
1-specifity
1,1
1,0
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0,0
-0,1
-0,1
0,1
0,3
0,5
0,7
0,9
1,1

Assessment of spatial heterogeneity



StO_2-MRI

- **Noisy maps**
- **Artifacts (Corpus Callosum)**

➔ **Reflection of oxygenation heterogeneity?**

ISTCT, Caen

GIN Grenoble

Grenoble Institut Neurosciences

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