

Amir G. Baroumand<sup>a,b</sup>, Roberto Santalucia<sup>c,d</sup>, Riëm El Tahry<sup>d</sup>, Pieter van Mierlo<sup>a,b</sup>

a. Medical Image and Signal Processing Group, Ghent University (MEDISIP), Campus UZ Corneel Heymanslaan 10, Entrance 36 - 5th floor, 9000 Gent, Belgium, b. Epilog, Clouds of Care NV, Vlasgaardstraat 52, 9000 Ghent, Belgium, c. Cliniques universitaires Saint-Luc, Paediatric Neurology Unit, Brussels, Belgium, d. Institute of Neurosciences (IoNS/NEUR), Université Catholique de Louvain (UCL), Brussels, Belgium

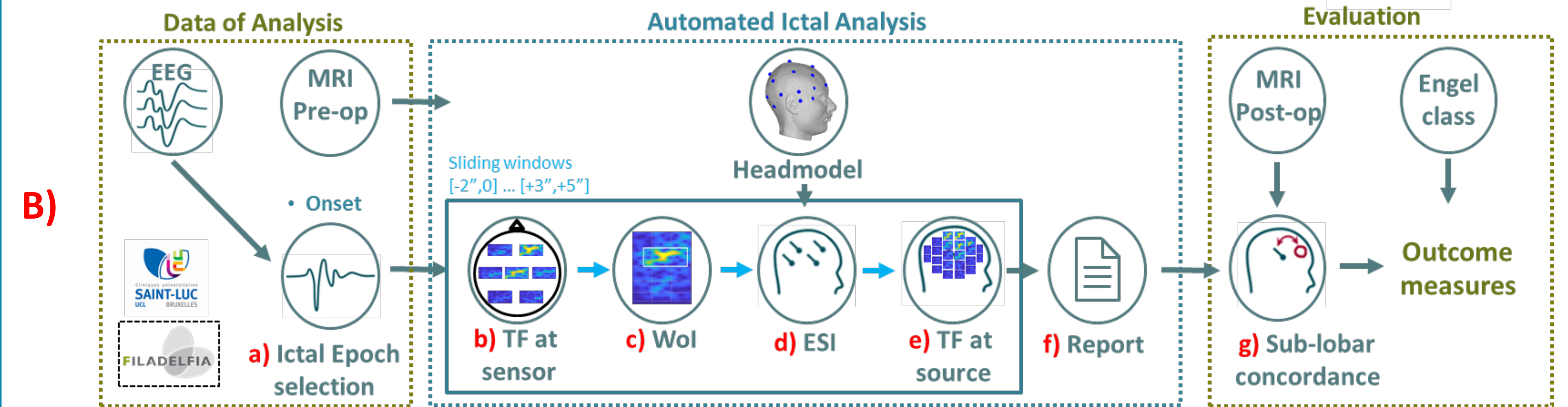
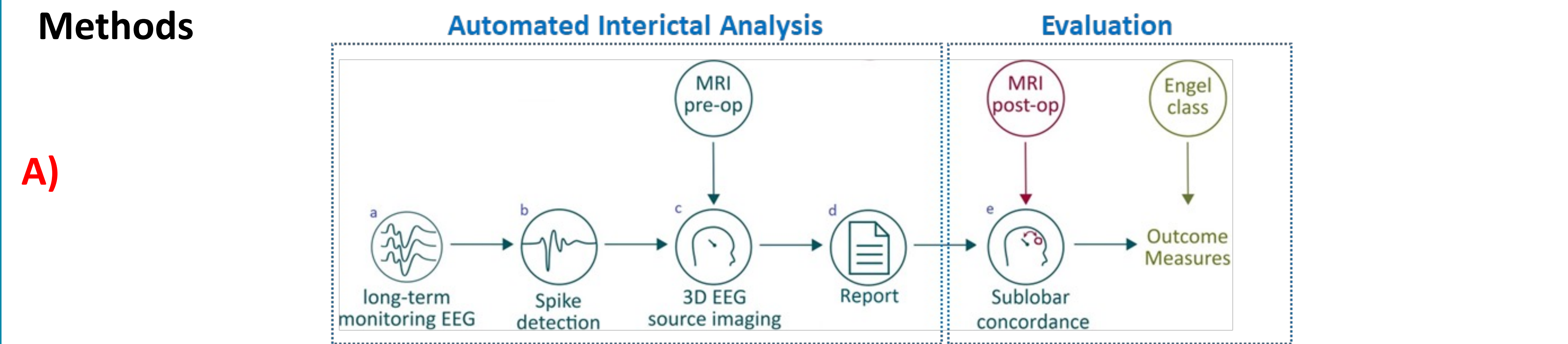
## Rationale

EEG source imaging (ESI) of interictal epileptiform discharges and ictal events is used in expert epilepsy centers during the presurgical evaluation to localize the epileptogenic focus by reparenting the **irritative zone** and the **seizure onset zone (SOZ)**. The utilization of semi-automated ESI is progressively gaining traction, particularly due to its validation within the adult population. Nonetheless, a gap in its validation persists, specifically concerning its **application in pediatric cases**.

## Aim

- In this study, both semi-automated interictal and semi-automated ictal analysis was performed.
- Data of 13 pediatric patients below 6 years of age that were in the presurgical evaluation and underwent surgery was analyzed.

## Methods

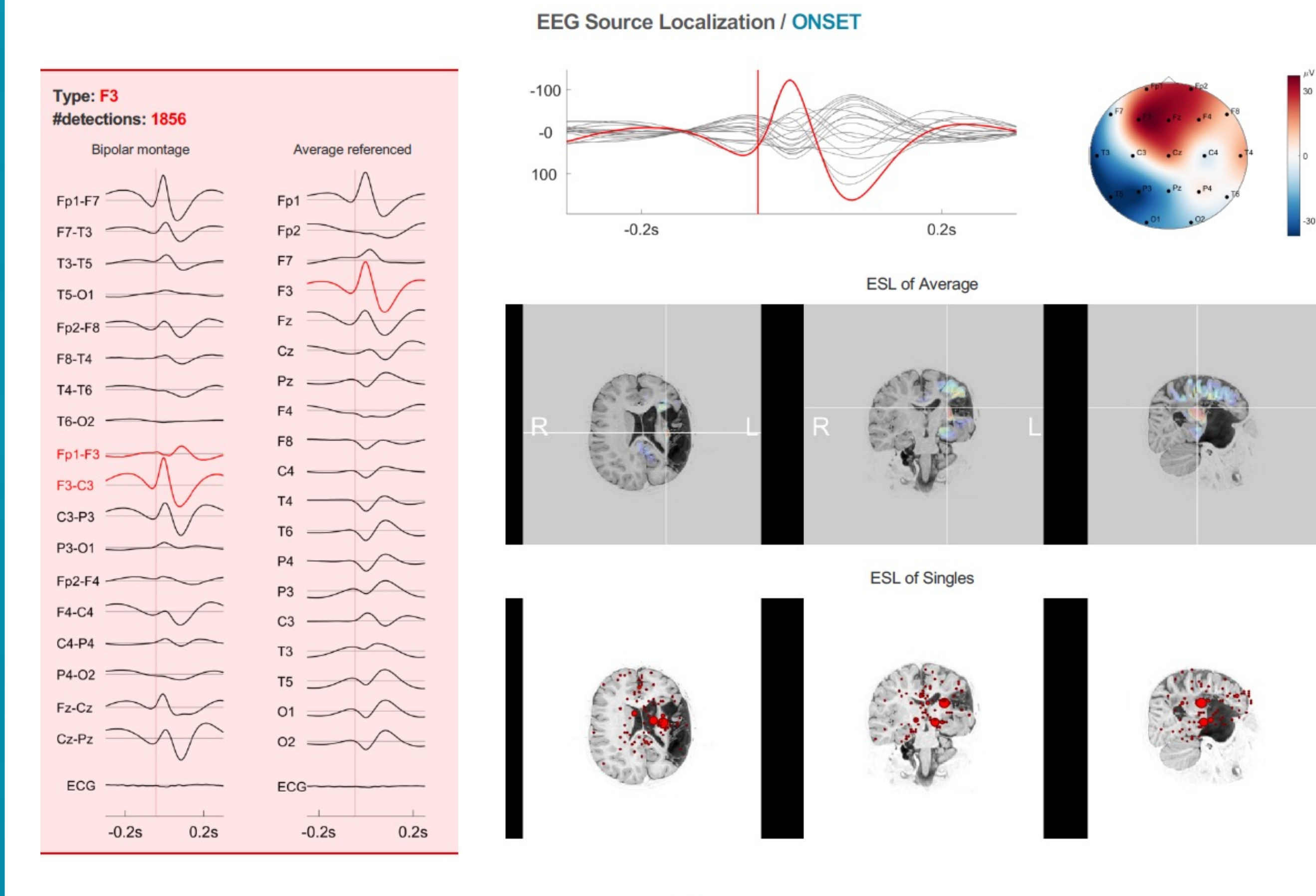


- a) marking of the ictal EEG onset (by expert electrophysiologist),  
 b) performing time-frequency (TF) analysis at sensor level, For each 2s sliding window between -2" and +5" with 1" overlap:  
 c) acquiring up to 2 window of interest (Wol) by a region growing procedure selecting those with highest energy,  
 d) applying ESI and mapping ictal waves to source space,  
 e) performing time-frequency (TF) analysis at source level and identifying the source with the highest energy as SOZ,  
 f) generating the ictal report,  
 g) evaluating the analysis by measuring sensitivity, specificity and accuracy at seizure- and patient- level and based on the post-surgical outcome.

## Results

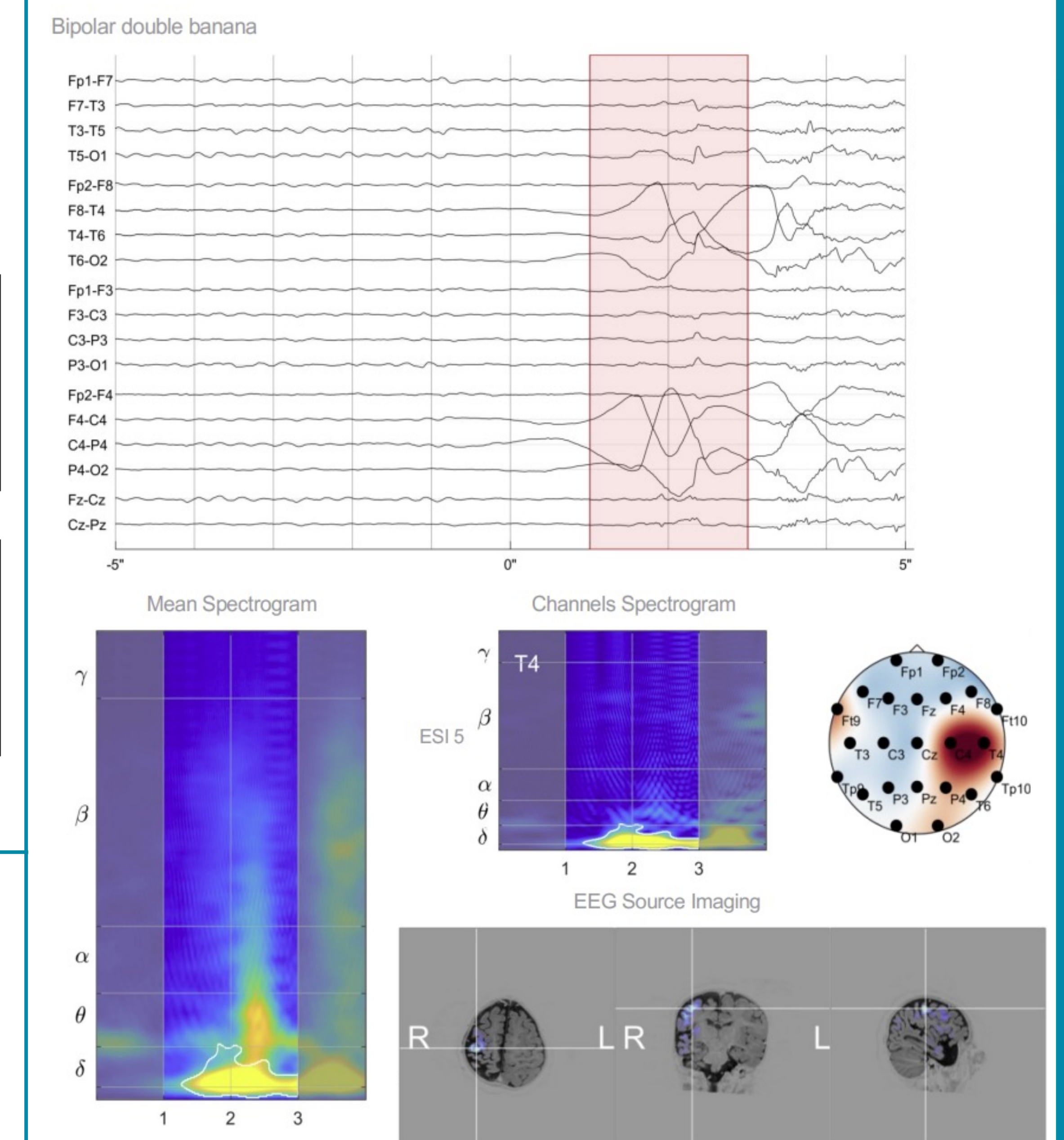
### Interictal ESI – case example

Engel I surgical outcome  
 localization in the cortex surrounding the left porencephaly



### Ictal ESI - case example

Engel I surgical outcome  
 Right parietal occipital atrophy



### Performance evaluation in 13 patients

	Interictal ESI	Ictal ESI
Sensitivity	60%	80%
Specificity	66%	33%
Accuracy	62%	69%
PPV	86%	80%
NPV	33%	33%

## Conclusion

- The results show the potential of interictal and ictal EEG source localization to localize the EZ in a pediatric population.
- Interictal and Ictal ESI can be complementary.
- The combination of both can potentially increase diagnostic accuracy, especially in patients with bilateral/contradictory EEG abnormalities