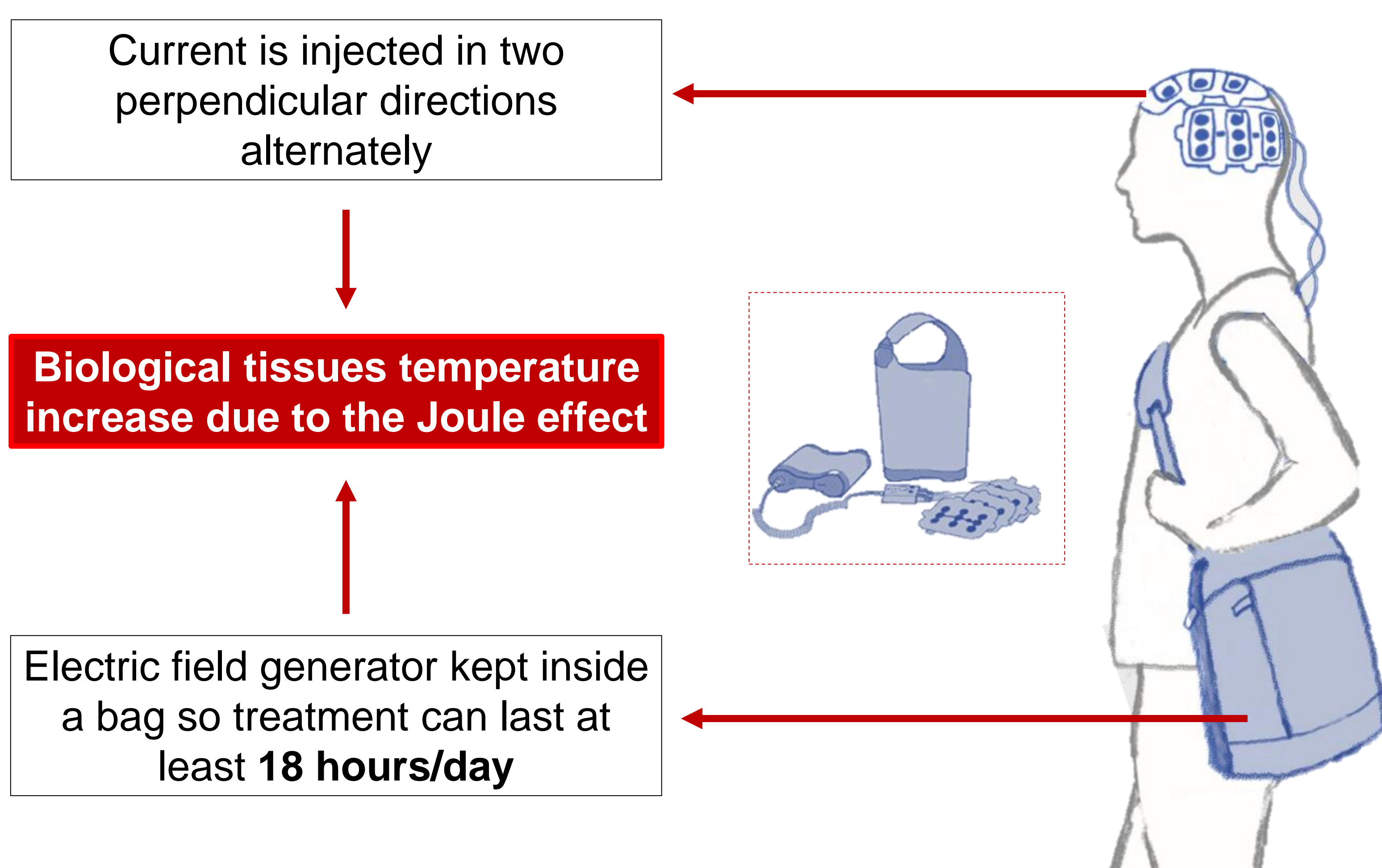


Introduction

Glioblastoma Multiforme (GBM) is one of the deadliest brain tumors. Its current standard of care includes surgery, radiation therapy, chemotherapy and, since 2011, Tumor Treating Fields (TTFields). The latter is a non-invasive technique that consists in applying an intermediate-frequency (100 – 300 kHz) alternating electric field (1 – 3 V/cm in the tumor) to affect the mitotic process of tumoral cells during metaphase and cytokinesis.

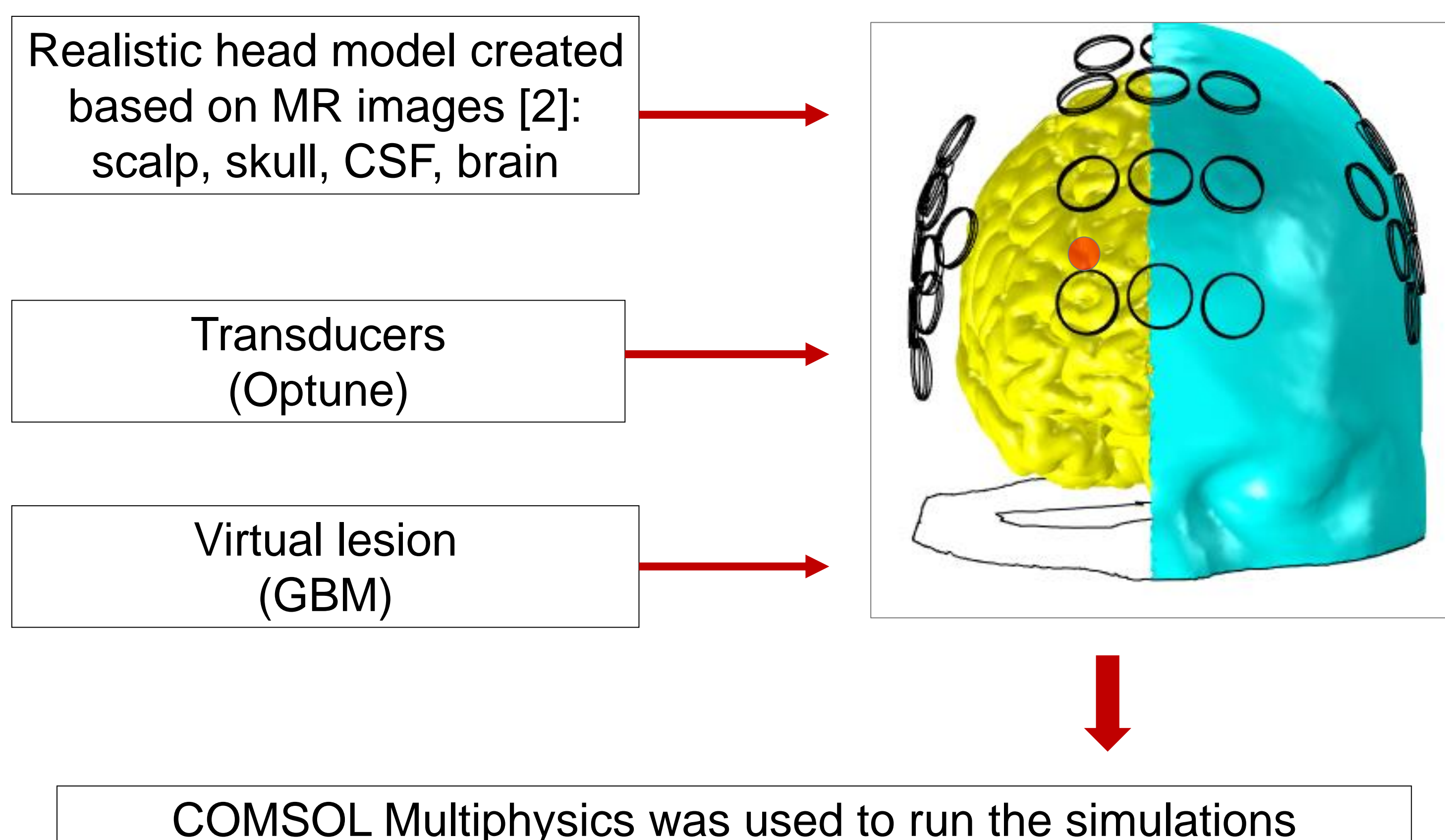
This FDA-approved technique is applied in patients using a device named Optune, developed by Novocure.



Goal

The goals of this work are to quantify the temperature increases during TTFields therapy and predict its thermal impact using a computational head model.

Methods



Results

Temperature distributions for scalp surface are presented in fig. 1. Increases occur mainly underneath the regions where the transducers are placed.

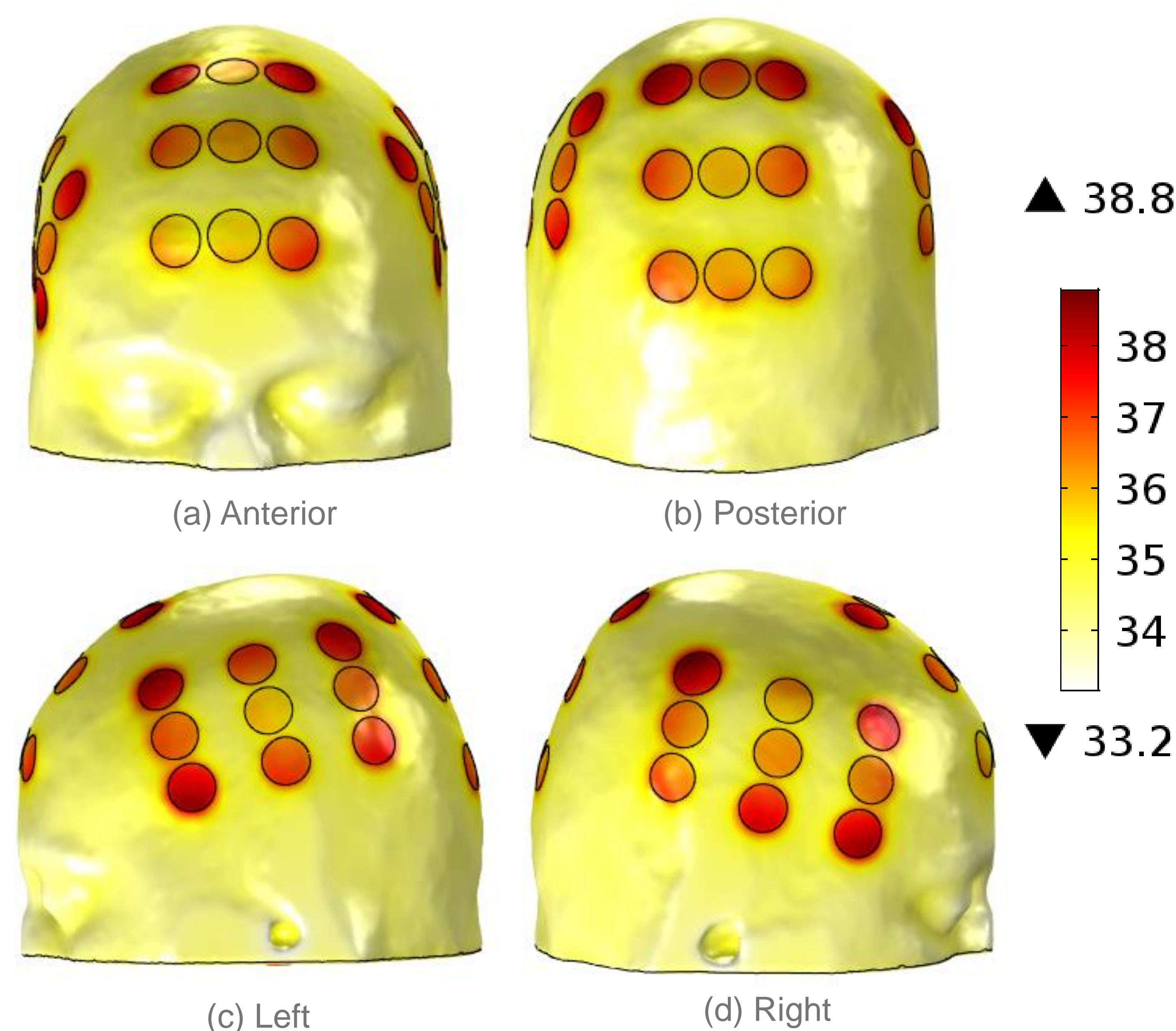


Fig. 1. Temperature increases in the scalp from four different perspectives. Heating is very localised and occurs mainly underneath the regions where the transducers are placed. Temperature values are in °C.

Discussion

For this range of temperature increases no significant thermal impact is expected to occur for any tissue, according to the literature. The maximum temperature is reached in the scalp, and it is within a safety range.

Conclusion

Tumor Treating Fields are safe from a thermal safety point of view. Experimental work might help to corroborate or disprove these findings.

Acknowledgments

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