**Title:**

Capabilities and limitations of a new thermal finite volume model for the evaluation of laser-induced thermo-mechanical retinal damage

**First Author:**

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**Abstract:**

Many experimental studies have been focusing on physical damage mechanisms of short-term exposure to laser radiation. In the nanosecond (ns) pulse range, damage in the Retinal

Pigment Epithelium (RPE) is most likely to occur at threshold levels due to bubble formation at the surface of the strongly absorbing melanosome. In order to model the bubble formation threshold and therefore the damage threshold, the energy uptake of the melanosomes is one key aspect. In this work a thermal finite volume model for investigations of temperature rise and temperature distribution of irradiated melanosomes is presented. The model takes different geometries of the melanosome into account as well heterogeneous energy absorption of the melanosome. For the first time, the effect of size and shape variation on the melanosomes thermal behavior is considered. The calculations illustrate the effect of the geometry on the maximum surface temperature of the irradiated melanosome and thus the impact on the bubble formation threshold. A comparison between the calculated bubble formation thresholds and the RPE cell damage thresholds within a pulse range of 3 to 5000 ns leads to a mean deviation of with a standard deviation of . The best agreement between the simulation and available RPE cell damage thresholds is achieved for pulse durations close to the thermal confinement time of single melanosomes.

**Short Biography:**

Markus Lücking studied engineering at the technical Universtiy of Braunschweig and Zaragoza. He´s working as a research scientist at the FZI Research Center for Information Technology. His research interest is in the modeling of laser-tissue interactions.

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