Combined Hydro- and Magnetohydrodynamical Model of Ball Lightning

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Several fluid, chemical, electrochemical or other models of ball lightning have many promising features (Bychkov, Nikitin, ...). So do the magnetohydrodynamical models (Callebaut, Vlasov, ...). The latter models have the advantage of allowing a great energy stocking, in particular the model of Callebaut based on force-free magnetic fields (i.e. fields which do not exert a force on their own

currents) or quasi force-free magnetic fields. The latter model has moreover the advantage that it can be combined with ("superposed to") another model without practically disturbing the equilibrium configuration. Nevertheless, problems arise in relation with the creation of such lightning balls of mixed character. Another problem is related to the fast decay of the magnetic field. In the magnetohydrodynamic model this is avoided by assuming high temperatures (at least in the electrical "veins", i.e. the channels where large currents flow). Thus, the electrical resistivity can be very low (runaway electrons), and the corresponding decay time much longer. However, this poses questions in a combined model.

The combination of both models yields great perspectives for many cases of ball lightning, at least for those which are generated by lightning. A further advantage is that the mixing of the force-free magnetic model with another model may happen in all proportions. This means that a very great scale of phenomena may be treated.

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