

## What does $\text{curl } \underline{B} = \underline{j}$ ?

It is a great pleasure to acknowledge the excellent guidance of Dr. N. Fukushima in my work as one of his graduate students. I still recall many occasions, mostly after his office hours, when we discussed the results of joint projects and my thesis work, in particular, in terms of their interpretation. I also remember being frustrated at times as I was forced to recognize the limitations of ground-based magnetic observations from which one can only infer what is happening far in the magnetosphere. After becoming “physically” independent from Fukushima sensei, I have spent the last decade trying to find ways in which we can disclose more than “What does  $\text{curl } \underline{B} = \underline{j}$ ?”

After seeing all the corrections standing out in red ink which were made by Prof. Fukushima on the first draft of my papers, I knew that the two problems I would pursue would be “substorm dynamics” and “ $\text{curl } \underline{B} = (\underline{s}) \cdot \underline{E}$ ”. It was my opinion that in this way we would be able to get deep insights into the actual physics of magnetospheric processes, not just the static current system.

Fortunately, it was about that time (the early 70’s) that high-quality data of ionospheric electric fields, conductivities, and field-aligned currents, as well as auroral imagery and particle precipitation, became available from direct measurements on an individual basis. Quite naturally I jumped at these new data sets. The present paper, dedicated to Fukushima sensei, describes some of the efforts already made and being made toward developing a scheme in which one can play consistently with these different physical quantities. There is, of course, a lot of improving left to do on the entire scheme in challenging the two problems, and, moreover, new problems are constantly being found as well. Nevertheless, I would like to emphasize once again the importance of combining different data and different models to form a consistent view.

<On the occasion of Professor N. Fukushima’s retirement from the University of Tokyo>