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California Environmental Protection Agency  
Air Resources Board  
Byron Sher Auditorium, Second Floor  
1001 I Street  
Sacramento, California 95814

**Subject:       Comments on the Use of Remote Sensing and other Geo-spatial  
                  Datasets for Assessment of Land Use Change**

Dear Air Resources Board:

In your proposed regulation to implement a low carbon fuel standard in California you have suggested a penalty be applied to bio-fuels associated with in-direct land use change and cited a paper titled "Farming the planet: Geographic distribution of global agricultural lands in the year 2000" as part of your documentation. I am a researcher at the Energy Resources Center at the University of Illinois at Chicago with 15 years experience in measuring land use change using remote sensing as a tool. Many of those years were spent with a NASA contractor examining the use of sensors such as MODIS and SPOT as tools for agriculture and land use. I reviewed this paper and noted that two remote sensing datasets, the Boston University MODIS-derived land cover product and the SPOT Vegetation sensor derived GLC2000 land use dataset were used to, at least partially, assess land use for the year 2000. I would present a word of caution when using remote sensing or any other geospatial dataset to assess land use change. The error associated with the dataset cannot be larger than the rate of change in order for it to be a useful tool. Errors and resolutions associated with remote sensing datasets, especially global datasets, are typically too large to measure changes at the scale of most land use change (typically on a local scale). It is for this reason that the MODIS-derived land cover team suggests their dataset not be used for assessing regional or local change. From my own experience, I recognize the great difficulty in a global assessment of land use and admire the methods brought forth in the study. However, I would like to present some specific questions for your consideration and would be most interested in any opportunity for further discussion.

One question I have is regarding the accuracy of the inventories used for the study. The researchers identify the use of the inventory data as truth and use it to calibrate the remote sensing datasets. How accurate are these inventories (compilations from different countries, different years, different methods, different classes and different resolutions)? Again, if the error associated with these datasets is greater than the rate of change associated with bio-fuel introduction are these a viable method for assessment? Also, the correlation coefficients for the relationship between the remote sensing datasets and inventory data are low enough to indicate some disagreement. Is this disagreement greater than the rate of change associated with bio-fuels? The

confidence range cited by the authors for their dataset is 5mil kilometers<sup>2</sup> for agriculture and 6.4mil kilometers<sup>2</sup> for pasture. The model prediction for pasture is off from the inventory data they use by 3.5mil kilometers<sup>2</sup>. The study also indicates their global estimate for cropland is down from their own 1992 assessment by 3mil kilometers<sup>2</sup>. The study authors acknowledge there are "large uncertainties" in the data (pg 17 of 19 last paragraph) and more work is required.

As you know, the land cover type converted to crops used for the production of bio-fuels will play a large role in the extent of greenhouse gas emissions. I would suggest errors associated with datasets used to predict land cover types for conversion be taken into account when assessing penalties and that the rule use conservative numbers as a compensation for these errors.

I would be happy to discuss these comments, and other methods that could be considered by the board to reduce and/or compensate for these potential errors.

Best Regards,

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Senior Engineer

**UIC**

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