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Improved Spatial Resolution of the Sodium Distribution on Mercury

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The distribution of sodium emission over the surface of Mercury is non-uniform, and changes over time. These non-uniformities and time-dependent changes give clues to the processes that produce the sodium. However, observations of the distribution of sodium on Mercury are hampered by the bad seeing that accompanies the need to observe either in daytime, or at extremely large air masses in twilight. In an effort to improve this situation, we have developed an image stabilizer utilizing a piezoelectric driven tip-tilt correction mirror for daytime spectral imaging of Mercury. The system is a modification of one that was originally developed for solar observations at the McMath-Pierce solar telescope. Use of image stabilization results in a noticeable improvement in spatial resolution of our Mercury sodium images. A series of sodium images taken over an eight-day period show changes in which an emission peak in high southern latitudes disappears, and is replaced by an emission peak at high northern latitudes. Further systematic observations and improvements are planned for the image stabilizer system, as well as experimental observations with a low-order adaptive optics system incorporating a commercially available 37-actuator deformable mirror.

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