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A Systematical Method to Search for Active Solar System Objects from the Pan-STARRS Postage Stamp Images

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The outgassing effect and dust coma formation process can provide important information on the composition of a comet. The observational study of cometary activity at large heliocentric distance is particularly valuable from this point of view (Epifani et al., 2009; Meech et al., 2009; Kelly et al., 2013). Since mid-2009 the Pan-STARRS project with a wide-field 1.8-m telescope has provided continuous all-sky 3-π survey of time variable phenomena. The data archive is an excellent source for the study of outgassing activities of comets as they orbited around the Sun. We have evaluated the level of gas emission rates of Jupiter Family Comets (JFCs) at different heliocentric distanced by examining the corresponding point-spread function profiles in the postage stamp images. In total, the time evolutionary history of the dust comas of 300 comets has been investigated in terms of the Afρ parameter. In the present work, we will report on the interesting finding that many JFCs exhibited coma activities at heliocentric distance beyond the snow line of about 2.5 AU outside which water ice sublimation will become negligible. Moreover, some comets were active even close to Jupiter's orbit. Four classes of Afρ variability can be identified: (1) activity around perihelion as expected of water sublimation process; (2) presence of coma activity independent of heliocentric distance; (3) point source like nucleus; and (4) no detection. Examples of these different coma behaviors will be described. In addition. Highlights will be given to the detection of outburst-like events near aphelion.