RADIATION EFFECTS IN WATER ICE IN THE SOLAR SYSTEM. R. A. Baragiola, M. Famá, M. J. Loeffler, U. Raut, J. Shi and B. D. Teolis, University of Virginia, Laboratory for Atomic and Surface Physics, Thornton Hall, Charlottesville, VA 22904, USA. E-mail: raul at virginia.edu.

Introduction: This presentation will describe the physical and chemical effects that occur in water ice at low temperatures (< 160K) as a result of irradiation with energetic ions, electrons, and UV photons in different regions of the solar system. This will be an update on the properties of vapor-deposited, low-temperature ice and radiation effects reviewed a few years ago [1]. After a brief description of basic phenomena we will give an update of experimental findings and applications to solar system objects. The presentation will include the following topics:

1) Energy deposition and transfer – differences between exciting particles: light and heavy ions, electrons and UV photons.
2) Production of radiolytic species and comparative effects of different particles. Effect of excitation density on molecular formation (O_2, H_2O_2) [2-5].
3) Ion implantation, trapping and formation of new species that include the projectiles [5] and their thermal desorption [6,7].
4) Photodesorption and sputtering of water, H_2 and O_2 molecules as source of exospheres [5,8-10].
5) Synergistic effects of concurrent impacts of particles and atmospheric gases: enhanced trapping, production of ozone from ice [11].
6) Irradiation induced phase changes, compaction and their implications [12,13].
7) Radiolysis of mixed water:ammonia ices [7].
8) Electrostatic charging and surface potentials [14].

Within each topic, we will illustrate, with examples, how laboratory studies help understand specific instances of astronomical phenomena that have been captured by remote sensing.

The presentation will include published data from our laboratory as well as yet unpublished results of our recent experiments, some of which will be presented as posters.

References: [1] Baragiola, R.A. (2003) *Planet. Sp. Sci*. 51, 953-961. [2] Loeffler, M.J. and Baragiola, R. A. (2005), *GRL* 32, L172023. [3] Loeffler, M.J. et al (2006) *Icarus* 180, 265-273. [4] Loeffler, M.J. et al (2006) *J. Chem. Phys.* 124, 104702. [5] Teolis, B.D. et al (2005) *Phys. Rev*. B 72, 245422. [6] M. J. Loeffler, Teolis, B.D. and Baragiola, R.A. (2006) *Astrophys. Journal Lett* 639, L103-L106. [7] Loeffler, M.J., Raut, U. and Baragiola, R.A., *Astrophys. J. Letters* 649, L133–L136 [8] Baragiola, R.A. et al. (2003) *Nucl. Instr. Meth. Phys. Res*. B 209, 294-303. [9] Vidal, R.A., Teolis, B.D. and Baragiola, R.A. (2005) *Surface Sci.* 588, 1-5. [10] Famá, M., Shi, J. and Baragiola, R.A. *Surface Sci.* 602, 156. [11] Teolis, B.D. et al., (2006) *Astrophys. J. Letters* 644, L141-L144. [12] Baragiola, R.A. et al (2005) *Rad. Phys. Chem.* 72, 187-191. [13] Raut, U. et al (2007) *J. Chem. Phys.* 126, 244511. [14] Shi, J., Fama, M. and Baragiola, R.A. (2008) – this conference