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 -----README FILE-----
 

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README -- describes contents of CAC Emission Inventory directory

13 June, 2012

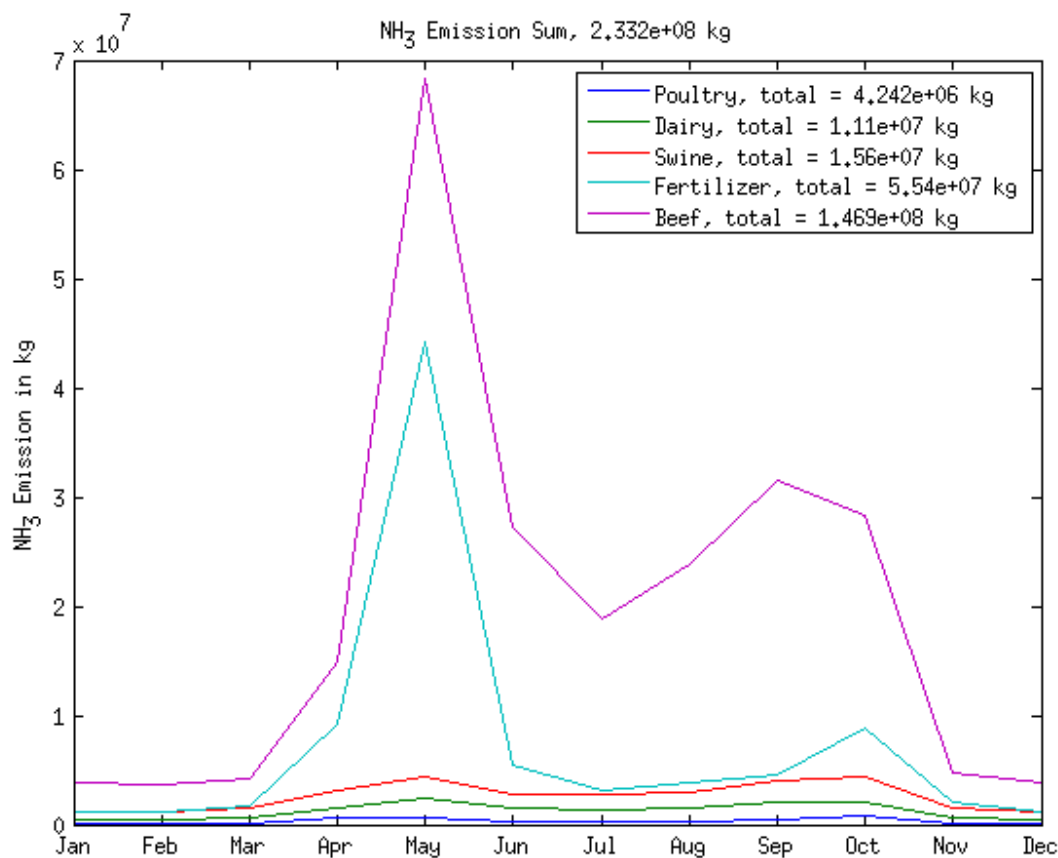
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### Introduction:

The current (v9-01-02) ammonia emission inventory in GEOS-Chem for Canada has no seasonal variation, we implemented a new monthly ammonia emission inventory. The monthly ammonia emission data was obtained by Agriculture Canada's detail survey from agricultural activities. The survey contains data from five major agricultural ammonia sources: beef, dairy, fertilizer, poultry, and swine.

The emission spike in May is mainly caused by fertilizer application ([Sheppard, Bittman, & Bruulsema, 2009](#)). A secondary cause for the early spring high ammonia emission is the high crude protein content of the animal feed which exceeds the animals' needs and results in enhanced nitrogen excretion ([Sheppard & Bittman, 2011](#)). The ammonia emissions from the dairy ([Sheppard & Bittman, 2011](#); [Bittman & Tait, 2011](#)), poultry ([Sheppard et. al., 2008](#); [Sheppard, Bittman, & Tait, 2008](#)), and swine ([Sheppard et. al., 2010](#)) categories are also emitted from the manure storage and landspreading, which causes the peak emissions in early spring and late fall. However, the emission amount is not as significant as the beef and fertilizer categories. Manure slurry injection for the dairy, poultry, and swine categories can prevent the loss of ammonia which reduces the emission. An updated emission inventory should be implemented in the future when the slurry injection system becomes more commonly used.



**References:**

- Bittman, S., and Tait, J. (2011), Modelling monthly NH<sub>3</sub> emissions from dairy in 12 Ecoregions of Canada, *Can. J. Anim. Sci.*, 91(4), 649-661.
- Sheppard, S. C., Bittman, S., Beaulieu, M., and Sheppard, M. I. (2008), Ecoregion and farm-size differences in feed and manure nitrogen management: 1. Survey methods and results for poultry, *Can. J. Anim. Sci.*, **89**, 1-19.
- Sheppard, S. C., Bittman, S., Swift, M. -L., and Tait, J. (2010), Farm practices survey and modelling to estimate monthly NH<sub>3</sub> emissions from swine production in 12 Ecoregions of Canada, *Can. J. Anim. Sci.*, 90(2), 145-158.
- Sheppard, S. C., and Bittman, S. (2011), Farm survey used to guide estimates of nitrogen intake and ammonia emissions for beef cattle, including early season grazing and piosphere effects, *Anim. Feed Sci. Technol.*, **166-167**, 688-698.
- Sheppard, S. C., and Bittman, S. (2011), Ecoregion and farm size differences in dairy feed and manure nitrogen management: A survey, *Can. J. Anim. Sci.*, 91(3), 459-473.
- Sheppard, S. C., Bittman, S., and Bruulsema, T. W. (2009), Monthly ammonia emissions from fertilizers in 12 Canadian Ecoregions, *Can. J. Soil Sci.*, **90**, 113-127.
- Sheppard, S. C., Bittman, S., and Tait, J. (2008), Monthly NH<sub>3</sub> emissions from poultry in 12 Ecoregions of Canada, *Can. J. Anim. Sci.*, **90**, 21-35.

**Files included for the Agriculture Canada ammonia emission inventory:**

emissions\_mod.F

cac\_anthro\_mod.F

Twelve 1x1 emission bpch files

Twelve 0.5x0.666 emission bpch files

bpch files:

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Anthro ammonia emissions [kg/month], base year 2008

CAC2008-NH3-01.geos.1x1

CAC2008-NH3-02.geos.1x1

CAC2008-NH3-03.geos.1x1

CAC2008-NH3-04.geos.1x1

CAC2008-NH3-05.geos.1x1

CAC2008-NH3-06.geos.1x1

CAC2008-NH3-07.geos.1x1

CAC2008-NH3-08.geos.1x1

CAC2008-NH3-09.geos.1x1

CAC2008-NH3-10.geos.1x1

CAC2008-NH3-11.geos.1x1

CAC2008-NH3-12.geos.1x1

CAC2008-NH3-01.geos.1t2x2t3

CAC2008-NH3-02.geos.1t2x2t3

CAC2008-NH3-03.geos.1t2x2t3

CAC2008-NH3-04.geos.1t2x2t3

CAC2008-NH3-05.geos.1t2x2t3

CAC2008-NH3-06.geos.1t2x2t3

CAC2008-NH3-07.geos.1t2x2t3

CAC2008-NH3-08.geos.1t2x2t3

CAC2008-NH3-09.geos.1t2x2t3

CAC2008-NH3-10.geos.1t2x2t3

CAC2008-NH3-11.geos.1t2x2t3

CAC2008-NH3-12.geos.1t2x2t3

CAC ammonia emission data files (bpch format) were provided by Agriculture Canada (Shabtai Bittman) and put together by Wai-Ho Lo.

Emissions are all placed on the global 1x1 GEOS-Chem grid.

Nested grid files are placed on 0.5x0.666 GEOS-Chem grid.