PFC Emissions from Global and Australian Aluminium Production Using AGAGE Data

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Perfluorocarbons (PFC-14: CF_4, PFC-116: C_2F_6) are powerful greenhouse gases released during the production of aluminium and from the electronic industry. PFCs remain in the atmosphere for 1000s of years and are targeted for controls in global and Australian strategies to reduce greenhouse gas emissions. In Australia, PFCs account for about 20% of the greenhouse gases released at the smelter during the production of aluminium, the remaining 80% being carbon dioxide from the production (15%) and consumption (65%) of carbon anodes during the electrolysis of alumina ($2Al_2O_3 + 3C \rightarrow 6Al + 3CO_2$) (Keniry, 2007). Global production of primary aluminium is growing at 8% per year, driven by the huge demand in China (Figure 1), currently growing at about 20-35% per year. Australian aluminium production (6% of global) is growing at 2% per year (IAI, 2008). AGAGE global atmospheric observations of PFCs can be used to calculate time-dependent global PFC emissions, which, when coupled with information on global aluminium production and the emission of PFCs from the electronics industry, lead to time-dependent, globally-averaged PFC emission factors for aluminium production (Mühle et al., 2008). Atmospheric PFC observations made at Cape Grim, Tasmania (*in situ*, air archive, 1978-2008), and at Aspendale, Victoria (2006-2008) and on Antarctic air tapped in ice and firn (1840-2000), using a Medusa GC-MS system (Miller et al., 2008), are used to deduce time-dependent Australian PFC emissions and emission factors (Fraser et al., 2007). The global and Australian aluminium industries have set a target of reducing PFC emission factors (PFC released per tonne of aluminium produced) by 80% from 1990 levels by 2010.

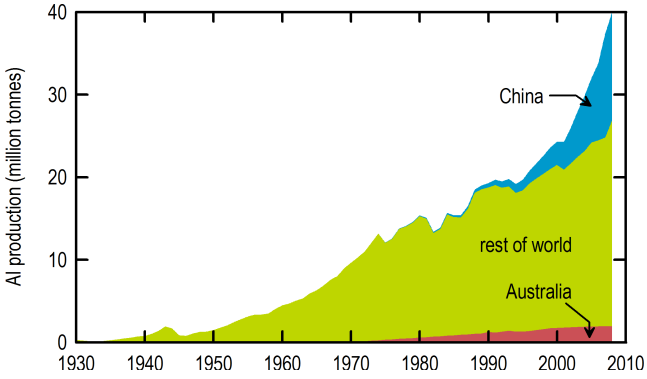

Figure 1. Global aluminium production (IAI, 2008).

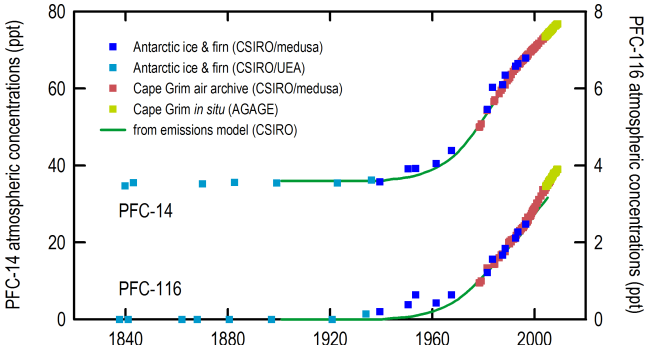

Figure 2. PFCs in the Southern Hemisphere from AGAGE measurements at Cape Grim, on the Cape Grim air archive and on air samples from Antarctic firn and ice (Fraser et al., 2007). CF_4 data are in the SIO 2005 scale, C_2F_6 data in the preliminary SIO 2007 scale.