Adventures with CO_2 at the Mt. Bachelor Observatory

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he Mt. Bachelor Observatory (MBO) is a high-elevation (2.8 km asl) research site located on the summit of Mt. Bachelor in Central Oregon. The site was started by the University of Washington in 2004, with a focus on O_3, aerosols and related trace species. The Figure below shows an aerial view of Mt Bachelor. Since 2004, we have intermittent observations of CO_2, then starting in 2012 we initiated daily flask and continuous *in situ* observations, in collaboration with the NOAA-GMD. Our goals for this work are:

1. To characterize the boundary layer and free tropospheric distribution of this important greenhouse gas;
2. Use CO_2 as tracer of atmospheric processes;
3. Use CO_2 with other tracers (such as CO) as a means to gauge combustion efficiency and source type.
4. Use the MBO data to constrain continental inflow of CO_2, CH_4 and other gases for global flux estimates.

One particular question we wanted to address with our observations is "why does CO_2 frequently not appear enhanced in biomass burning plumes? Using our CO_2 data over the past several years we have reached several conclusions:

1. In most seasons CO_2 is enhanced in free tropospheric air, compared to boundary layer air (McClure et al 2015).
2. Wildfire plumes may contain enhanced CO_2 due to biomass combustion, but if the transport pathway to MBO is long and in the boundary layer, enhanced CO_2, can be obscured by surface uptake (McClure et al 2015).
3. We have developed a new approach to calculate the modified combustion efficiency (MCE) that considers mixing with background air and the associated uncertainty in MCE (Briggs et al 2016).

In this presentation, I will give an overview of MBO gas and aerosol observations over the past 12 years, with a focus on these results using CO_2.

Figure 1. Mt. Bachelor located in central Oregon.