Overview and description of the experiments

The SBLI experiment database contains

A detailed description of the experiments and analysis of the results are available in the PhD thesis of Laura Campo ("Effects of Shock Strength, Confinement, and Geometric Perturbations on Shock Boundary Layer Interactions" Stanford University, 2014). The experimental setup is described in detail in chapter 2, and the results are presented and analyzed in chapter 3. Analysis of uncertainties and biases is provided in chapter 2 (section 2.4) and in chapter 5. A PDF copy of the thesis (**Campo_thesis.pdf**) is provided for reference.

This database includes results from two SBLI experiments – one with a 3mm tall compression ramp ($h_{ramp}/\delta_0 = 0.56$) and one with a 5mm tall compression ramp ($h_{ramp}/\delta_0 = 0.93$). In both cases the ramp is fully spanning and inclined at an angle of 20 degrees. The incoming freestream velocity is $U_\infty = 530$ m/s ($M_\infty = 2.05$) and the incoming boundary layer height is $\delta_0 = 5.4$mm. Other inflow properties are listed in Tables 3.1 and 3.2 of the thesis.

Two-dimensional two-component PIV data are acquired in four streamwise-vertical planes for each experiment. These data planes are denoted by their spanwise coordinate, z, which is measured from the back wall of the wind tunnel:

for the h_{ramp} = 3mm geometry:	for the h_{ramp} = 5mm geometry:
z = 21mm (near centerplane)	z = 21mm (near centerplane)
z = 5.5mm	z = 8 mm
z = 4mm	z = 5.5mm
z = 2.5mm	z = 4mm

There are a total of eight data files (.mat format) included – one for each of the four data planes for each of the two test section geometries. The file names include info on which geometry and which plane correspond to a given data set (e.g. data_h=5mm_ramp_Z=21mm_plane.mat or data_h=3mm_ramp_Z=5.5mm_plane.mat)

The variables contained inside each of the data files are:

X	streamwise position, origin at foot of compression ramp [mm]
Y	vertical position, origin at bottom wall [mm]
Z	spanwise position of the data plane, origin at the back wall [mm]
U:	streamwise mean velocity [m/s]
V:	vertical mean velocity [m/s]
uprime:	streamwise velocity fluctuations normalized by U_∞ (dimensionless: u'/U_∞)
vprime:	vertical velocity fluctuations normalized by U_∞ (dimensionless: v'/U_∞)
uprimevprime:	Reynolds shear stress normalized by U_∞^2 (dimensionless: $u'v'/U_\infty^2$)

Each of these variables is a 1 x Ntiles cell, where Ntiles is the number of individual PIV camera tiles that make up the full measurement domain in each plane. Figures 3.8 - 3.15 and 3.26 - 3.41 from Laura Campo's Ph.D. thesis can be reproduced by running the included scripts, **plot3mmRampData.m** and **plot5mmRampData.m**. Note that you need to save the eight data files, the included colormap file (**customColormaps.mat**) and the two scripts in the same directory. The velocity variables in regions of the data that are invalid due to low vector yield are intentionally set to NaN to mask them from the final data representation.