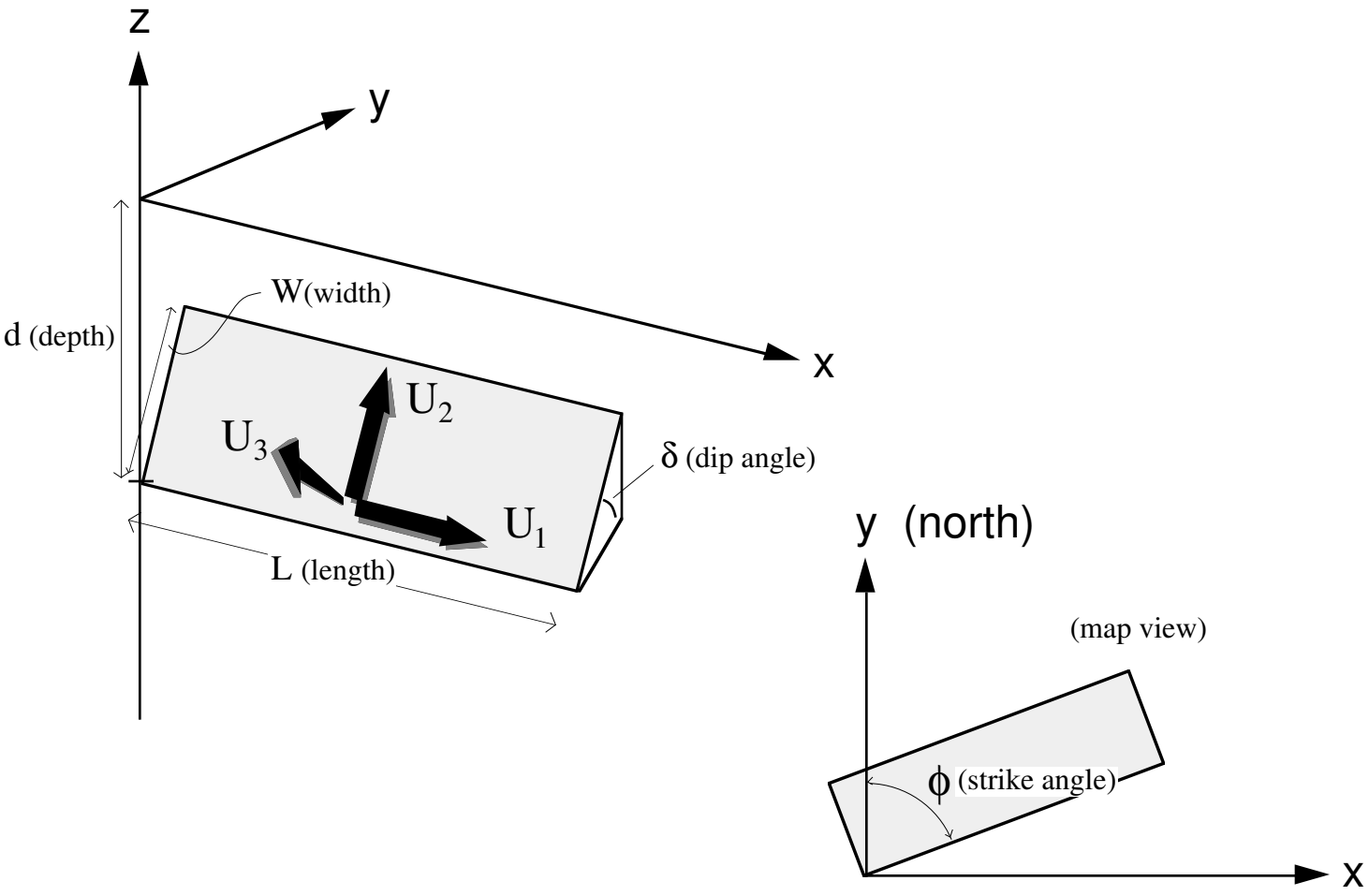
Elastic Dislocation Fault Parameters



When running *disloc*, several parameters are needed to characterize each fault. The *location* of the fault is defined as the surface projection of the lower-left corner of the fault plane (shown as the origin here). The *depth* is the z-coordinate of the fault's bottom edge. The *dip* angle is measured from horizontal (as shown). The *strike* angle is the orientation (measured clockwise from north) of the surface projection of the fault's horizontal edges. The *length* and *width* are the dimensions of the rectangular fault. U_1 is the strike slip component of fault slip (positive for left-lateral). U_2 is the dip slip component of fault slip (positive for thrust). U_3 is the tensile component of fault slip (positive for opening).

The executable program *disloc* takes input from and writes output to ASCII text files. The program and source code can be found on photon in the directory '`~seismo/disloc`'. The form of the command line is:

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disloc infile outfile
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(If you type 'disloc' without arguments, you get help information, which is basically a synopsis of the information in this document.) You can either generate the input file manually yourself, or use the interactive input generator *setupdis*. It simply prompts you for the appropriate quantities.

When running *setupdis*, after giving the output file name, you will first be asked to supply the "latitude" and "longitude" of the origin. These actually do nothing, and should be set to zero. Next enter the generation parameter. This tells how you will specify the points at which you want calculated displacements. If it is 0, this means you will be giving it a list of arbitrary x,y points (good for irregularly distributed sites). If it is 1, this means you are asking for output at regularly spaced points on a rectangular grid (good for uniform coverage of an area if you want to later plot).

Next is either the list of x,y points, or a description of how to generate the rectangular grid. In the latter case, this consists of: starting x-coordinate, increment in x direction, number of steps in x direction, starting y-coordinate, increment in y direction, number of steps in y direction.

You will next be asked to supply the x coordinate and y coordinate of the first fault. You should enter the location of the fault's reference corner (see illustration) measured in units of distance (e.g. kilometers, <u>not</u> degrees). Next is the strike angle of the fault, measured clockwise from north as viewed from above (see diagram).

Next you give the vertical depth to the *bottom* of the fault, followed by the dip angle in degrees (zero for horizontal; 90° for vertical). Next are λ and μ, the Lamé elastic parameters. Actually, their absolute values are not important, only their ratio. $\lambda=\mu$ is the most common assumption for typical rocks.

U_1, U_2, and U_3 are the amounts of relative slip to apply to the fault surface in the strike slip, dip slip and tensile directions, respectively. Positive U_1 corresponds to *left-lateral motion* (opposite in sense to the San Andreas fault for example). Positive U_2 corresponds to *thrusting motion* with the hanging wall riding up over the foot wall (like the San Gabriel mountains for example). U_3 will not normally be used, since ordinary earthquake faults involve motion only tangential to the fault plane.

Finally the length and width of the rectangular fault surface (as illustrated) are entered. If you wish to model the effects of more than one fault, or build up a complex compound fault from rectangular "tiles", the input is simply repeated, starting with the next fault's x coordinate and y coordinate. When done entering faults, you signal the end to *setupdis* by typing <control-D>.