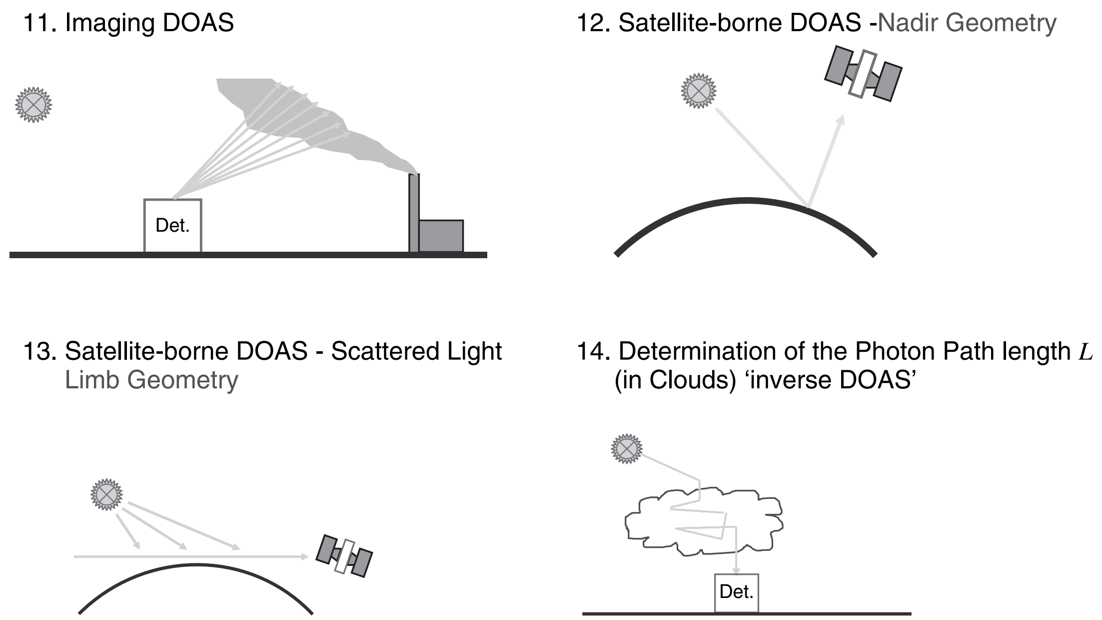


**Fig. 6.4.** Continued

light in the atmosphere. Spectroscopic detection is achieved by a spectrometer at the end of the light path. In general, active DOAS is very similar to classical absorption spectroscopy, as employed in laboratory spectral photometers. However, the low trace gas concentrations in the atmosphere require very long light paths (up to tens of kilometres in length, see above), making the implementation of these instruments challenging (see Chap. 7 for details). Active DOAS applications are typically employed to study tropospheric composition and chemistry, with light paths that are often parallel to the ground. In addition, active DOAS systems are also used in smog and aerosol chamber experiments.

The earliest applications of active DOAS, i.e. the measurement of OH radicals (Perner et al., 1976), used a laser as the light source along one single path (Fig. 6.4, Plate 1). This **long-path DOAS** setup is today most commonly used with broadband light sources, such as xenon-arc lamps, to measure trace gases such as $O_3$, $NO_2$, $SO_2$, etc. (e.g. Stutz and Platt, 1997a,b). Expansion of this method involves folding the light beam once by using retro-reflectors on one end of the light path (Axelsson et al., 1990). This setup simplifies the field deployment of long-path DOAS instruments. In addition, applications that use multiple retro-reflector setups to probe on different air masses are possible. Figure 6.4, Plate 2, shows the setup that is used to perform vertical profiling in the boundary layer with one DOAS system. An expansion that is currently under development is the use of multiple crossing light paths to perform tomographic measurements (Fig. 6.4, Plate 3).