= Air mass =

In meteorology , an air mass is a volume of air defined by its temperature and water vapor content . Air masses cover many hundreds or thousands of square miles , and adapt to the characteristics of the surface below them . They are classified according to latitude and their continental or maritime source regions . Colder air masses are termed polar or arctic , while warmer air masses are deemed tropical . Continental and superior air masses are dry while maritime and monsoon air masses are moist . Weather fronts separate air masses with different density (temperature and / or moisture) characteristics . Once an air mass moves away from its source region , underlying vegetation and water bodies can quickly modify its character . Classification schemes tackle an air mass ' characteristics , and well as modification .

= = Classification and notation = =

The Bergeron classification is the most widely accepted form of air mass classification , though others have produced more refined versions of this scheme over different regions of the globe . Air mass classification involves three letters . The first letter describes its moisture properties , with c used for continental air masses (dry) and m for maritime air masses (moist) . The second letter describes the thermal characteristic of its source region : T for Tropical , P for Polar , A for arctic or Antarctic , M for monsoon , E for Equatorial , and S for superior air (an adiabatically drying and warming air formed by significant downward motion in the atmosphere) . For instance , an air mass originating over the desert southwest of the United States in summer may be designated " cT " . An air mass originating over northern Siberia in winter may be indicated as " cA " .

The stability of an air mass may be shown using a third letter , either " k " (air mass colder than the surface below it) or " w " (air mass warmer than the surface below it) . An example of this might be a polar air mass blowing over the Gulf Stream , denoted as " cPk " . Occasionally , one may also encounter the use of an apostrophe or " degree tick " denoting that a given air mass having the same notation as another it is replacing is colder than the replaced air mass (usually for polar air masses) . For example , a series of fronts over the Pacific might show an air mass denoted mPk followed by another denoted mPk ' .

Another convention utilizing these symbols is the indication of modification or transformation of one type to another . For instance , an Arctic air mass blowing out over the Gulf of Alaska may be shown as " cA @-@ mPk " . Yet another convention indicates the layering of air masses in certain situations . For instance , the overrunning of a polar air mass by an air mass from the Gulf of Mexico over the Central United States might be shown with the notation " mT / cP " (sometimes using a horizontal line as in fraction notation) .

= = Characteristics = =

Arctic , Antarctic , and polar air masses are cold . The qualities of arctic air are developed over ice and snow @-@ covered ground . Arctic air is deeply cold , colder than polar air masses . Arctic air can be shallow in the summer , and rapidly modify as it moves equatorward . Polar air masses develop over higher latitudes over the land or ocean , are very stable , and generally shallower than arctic air . Polar air over the ocean (maritime) loses its stability as it gains moisture over warmer ocean waters .

Tropical and equatorial air masses are hot as they develop over lower latitudes . Those that develop over land (continental) are drier and hotter than those that develop over oceans , and travel poleward on the western periphery of the subtropical ridge . Maritime tropical air masses are sometimes referred to as trade air masses . Monsoon air masses are moist and unstable . Superior air masses are dry , and rarely reach the ground . They normally reside over maritime tropical air masses , forming a warmer and drier layer over the more moderate moist air mass below , forming what is known as a trade wind inversion over the maritime tropical air mass . Continental Polar air masses (cP) are air masses that are cold and dry due to their continental source region .

Continental polar air masses that affect North America form over interior Canada . Continental Tropical air masses (cT) are a type of tropical air produced by the subtropical ridge over large areas of land and typically originate from low @-@ latitude deserts such as the Sahara Desert in northern Africa , which is the major source of these air masses . Other less important sources producing cT air masses are the Arabian Peninsula , the central arid / semi @-@ arid part of Australia and deserts lying in the Southwestern United States . Continental tropical air masses are extremely hot and dry .

= = Movement and fronts = =

A weather front is a boundary separating two masses of air of different densities , and is the principal cause of meteorological phenomena . In surface weather analyses , fronts are depicted using various colored lines and symbols , depending on the type of front . The air masses separated by a front usually differ in temperature and humidity . Cold fronts may feature narrow bands of thunderstorms and severe weather , and may on occasion be preceded by squall lines or dry lines . Warm fronts are usually preceded by stratiform precipitation and fog . The weather usually clears quickly after a front 's passage . Some fronts produce no precipitation and little cloudiness , although there is invariably a wind shift .

Cold fronts and occluded fronts generally move from west to east , while warm fronts move poleward . Because of the greater density of air in their wake , cold fronts and cold occlusions move faster than warm fronts and warm occlusions . Mountains and warm bodies of water can slow the movement of fronts . When a front becomes stationary , and the density contrast across the frontal boundary vanishes , the front can degenerate into a line which separates regions of differing wind velocity , known as a shearline . This is most common over the open ocean .

= = Modification = =

Air masses can be modified in a variety of ways . Surface flux from underlying vegetation , such as forest , acts to moisten the overlying air mass . Heat from underlying warmer waters can significantly modify an air mass over distances as short as 35 kilometres (22 mi) to 40 kilometres (25 mi) . For example , southwest of extratropical cyclones , curved cyclonic flow bringing cold air across the relatively warm water bodies can lead to narrow lake @-@ effect snow bands . Those bands bring strong localized precipitation since large water bodies such as lakes efficiently store heat that results in significant temperature differences (larger than 13 ° C or 23 ° F) between the water surface and the air above . Because of this temperature difference , warmth and moisture are transported upward , condensing into vertically oriented clouds (see satellite picture) which produce snow showers . The temperature decrease with height and cloud depth are directly affected by both the water temperature and the large @-@ scale environment . The stronger the temperature decrease with height , the deeper the clouds get , and the greater the precipitation rate becomes .