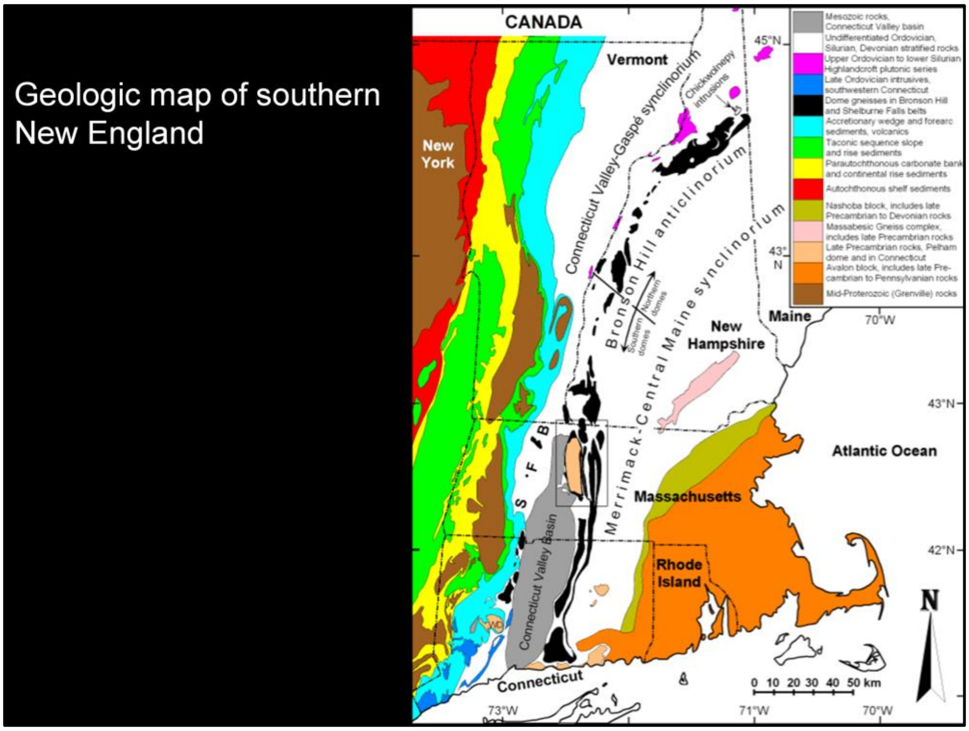
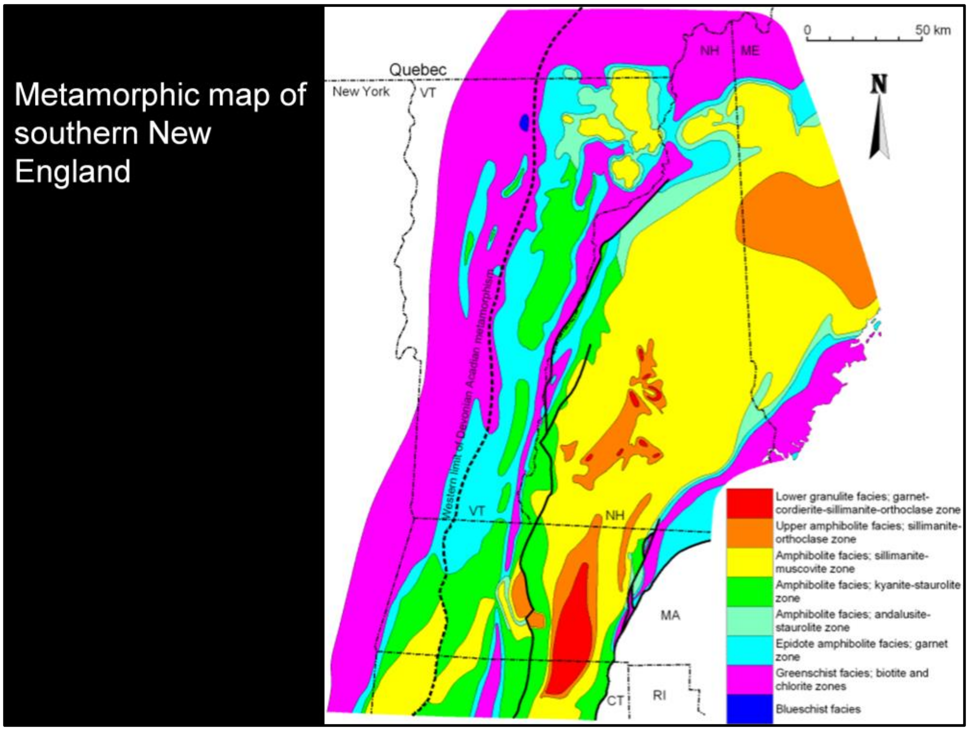


All of the samples collected here are from the white rocks in the Connecticut Valley-Gaspé synclinorium, Bronson Hill anticlinorium, and Merrimack-Central Maine synclinorium.

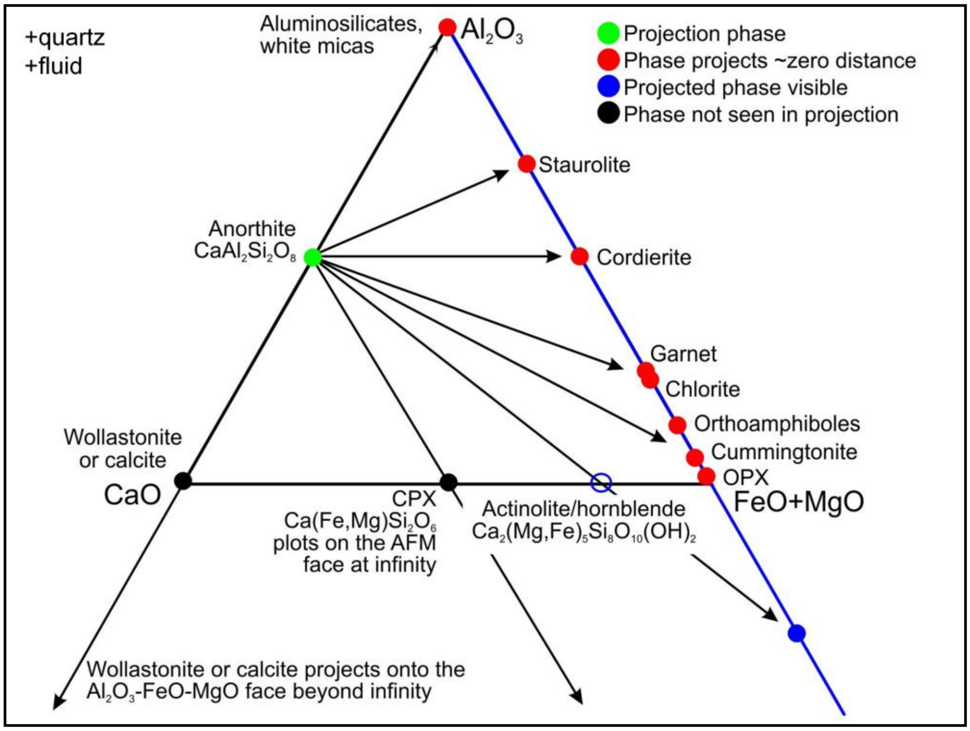


The samples were all metamorphosed in the Acadian (Devonian), though some in the south experienced high-grade metamorphism continuing into the Pennsylvanian. Pressures of metamorphism ranged from about 4 to 6 kbars.

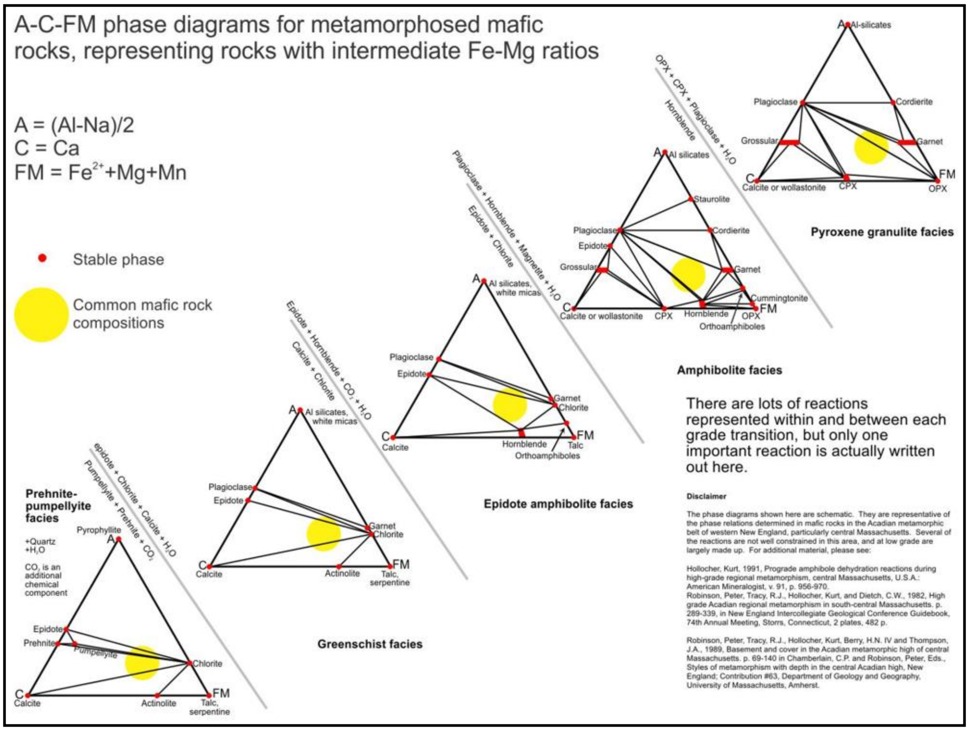
Metamorphosed basalt phase diagrams

"…basaltic rocks are the solace of magmatists in these days of virulent transformism! One may derive comfort from the reflection that here at least are rocks which, to begin with, are of undisputed eruptive origin, of well-known and generally remarkably uniform chemical and mineralogical composition, and of familiar texture. Such comfort disappears soon enough after a contemplation of their metamorphic equivalents, here collectively called metabasaltic rocks." Poldervaart (1953)

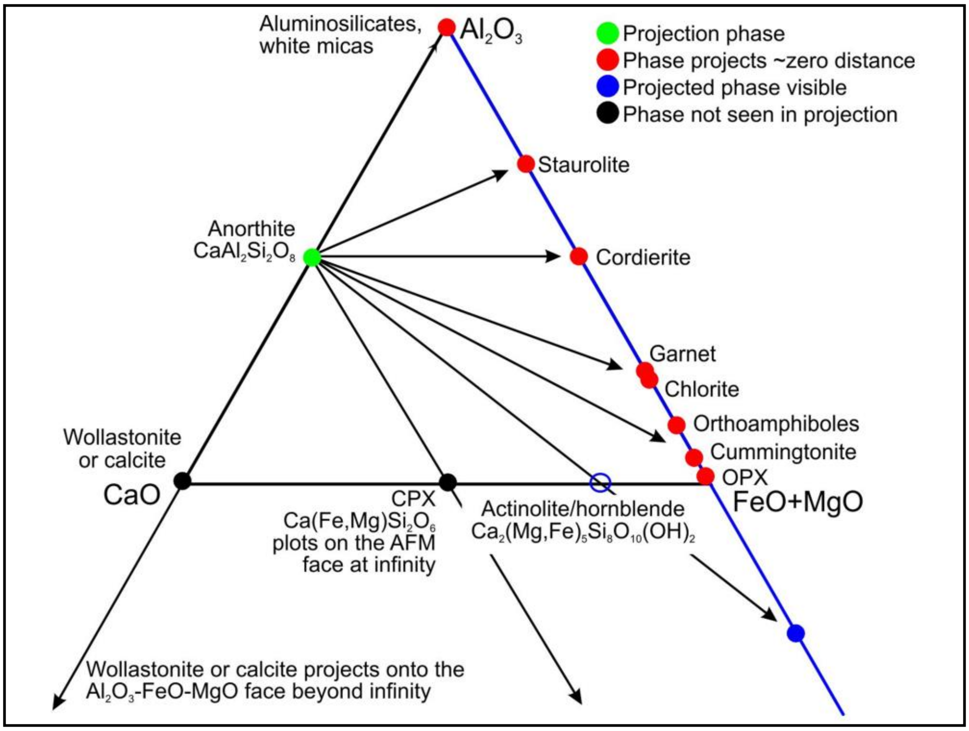
Bah! Primitive petrologists.



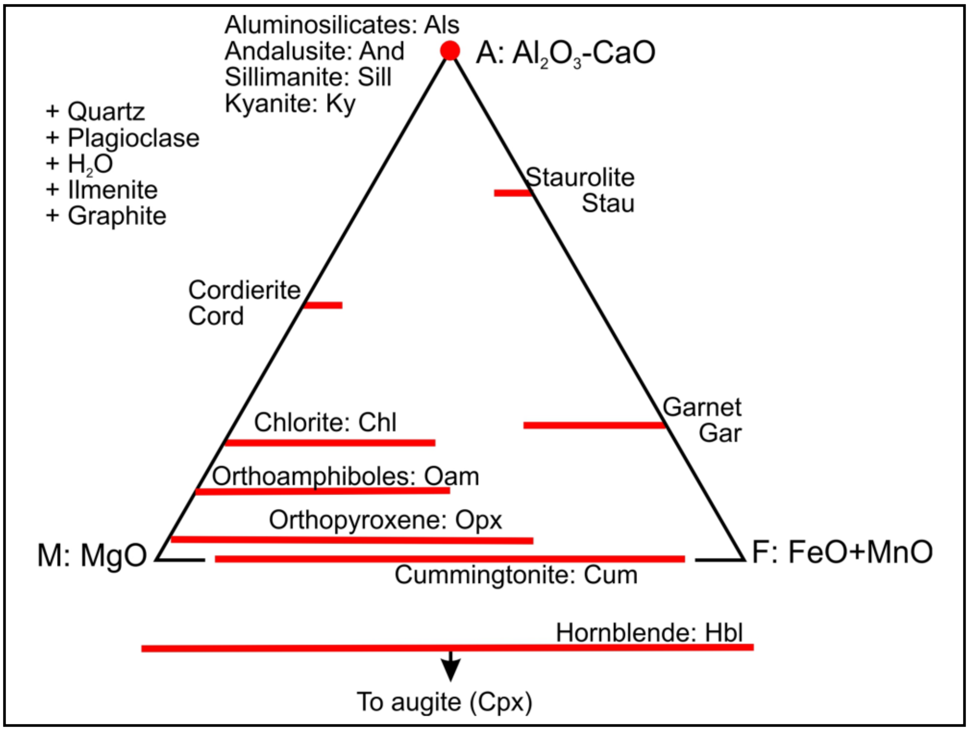
For the first set of phase diagrams we will use this side view of the ACFM tetrahedron (+quartz and fluid), only the ACF+M triangle above, without all the arrows and extensions. The example phase diagrams approximate the phase relations for rocks having Mg' values of 0.5-0.6. Looking at the whole 0-1.0 range at the same time results in many crossing tie lines.



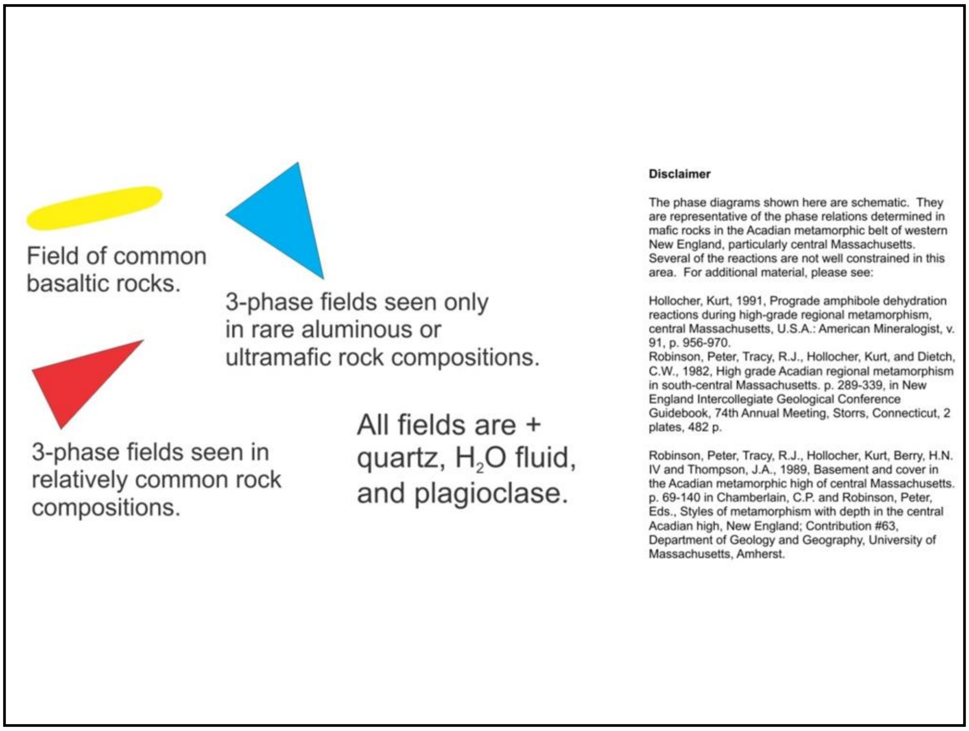
These ACFM triangles show schematic changes in phase relations with increasing metamorphic grade in a Barrovian-type regional metamorphic sequence. The field of common basaltic rocks is shown in yellow. Any 2-phase or 3-phase field that that is not included within the yellow field is not seen in these kinds of rocks. Hence, in the two diagrams in the lower left, no basaltic rocks have the assemblage chlorite-actinolite-talc/serpentine. These are seen only in metamorphic rocks. This diagram does not adequately address Na-rich plagioclase, which can occur in greenschist and epidote amphibolite facies. These diagrams show the chemical reactions that take place between different grades, indicated by the labeled gray lines and by changing of tie lines and 3-phase fields.



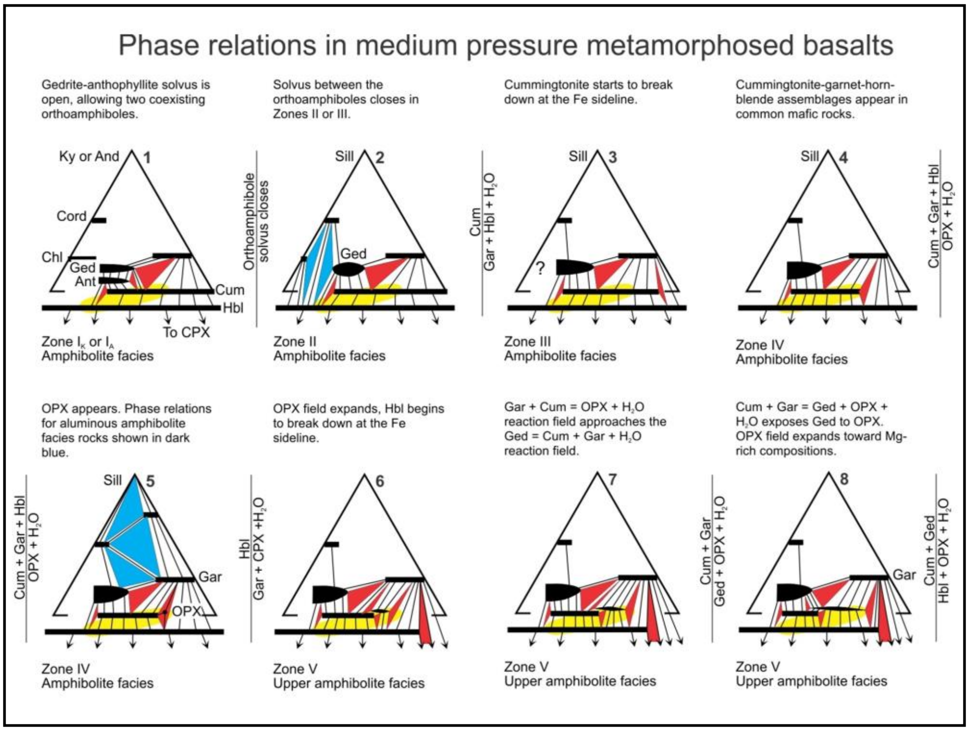
This diagram shows how wollastonite/calcite, Cpx, and actinolite/hornblende are graphically projected from anorthite onto the AFM plane (blue).



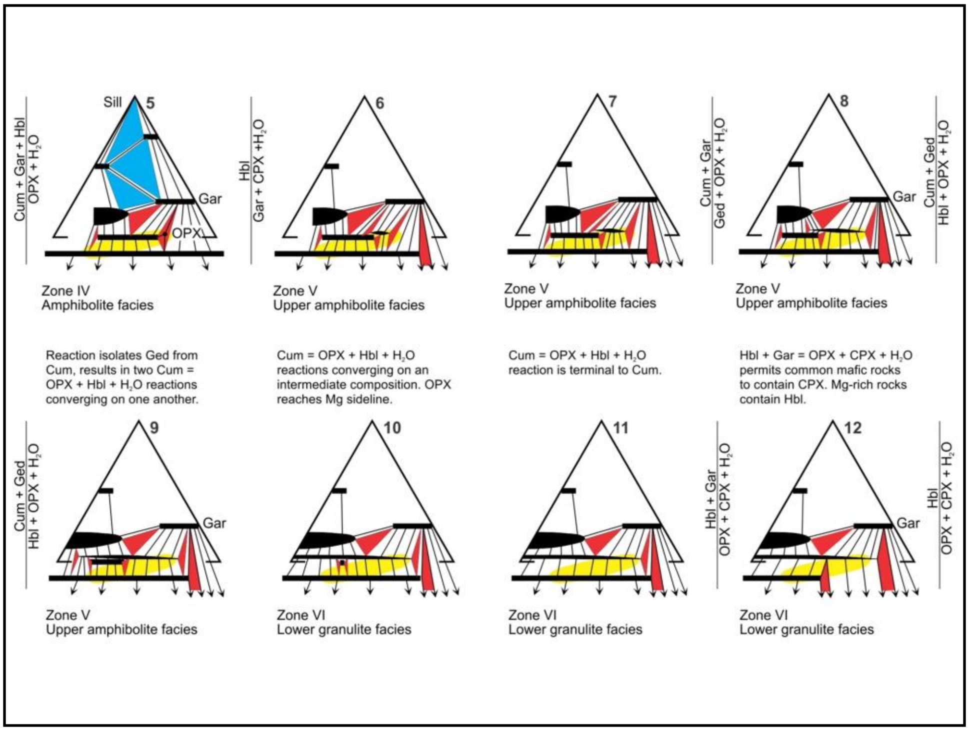
Plagioclase projection onto the AFM plane. In the phase diagrams that follow, these are the typical locations of different phases. Note that only hornblende and Cpx have been projected a significant distance.



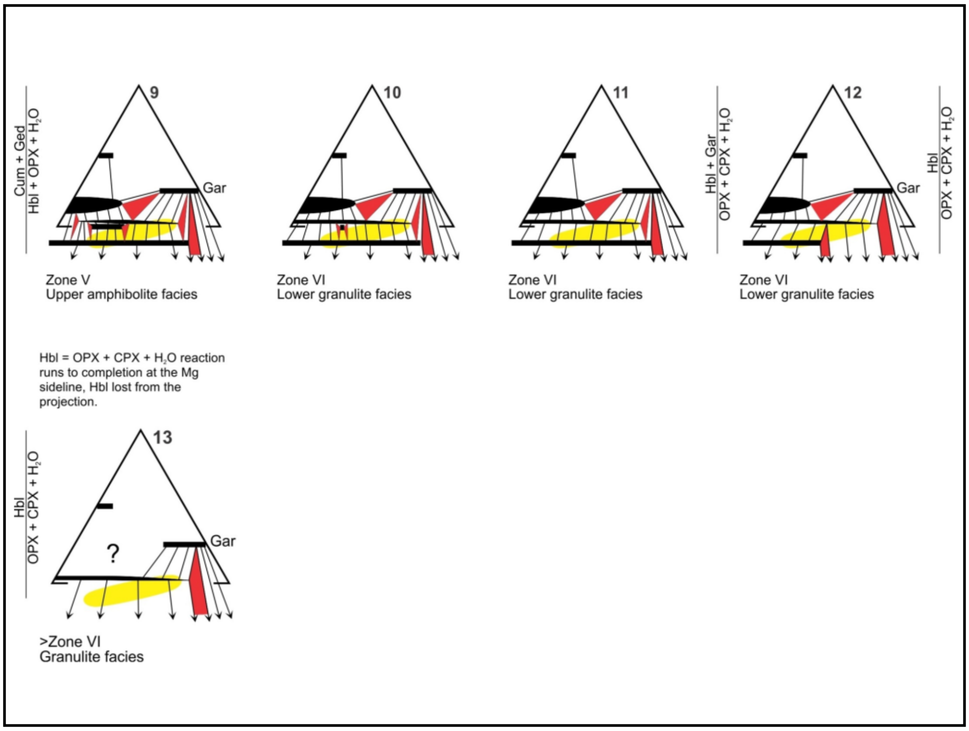
As in the first set of phase diagrams, common basalt fields are shown in yellow. Red 3-phase fields are those found relatively commonly in mafic volcanics. The blue 3-phase fields are seen rarely in ultramafic rocks or peculiar aluminous, low calcium rocks.



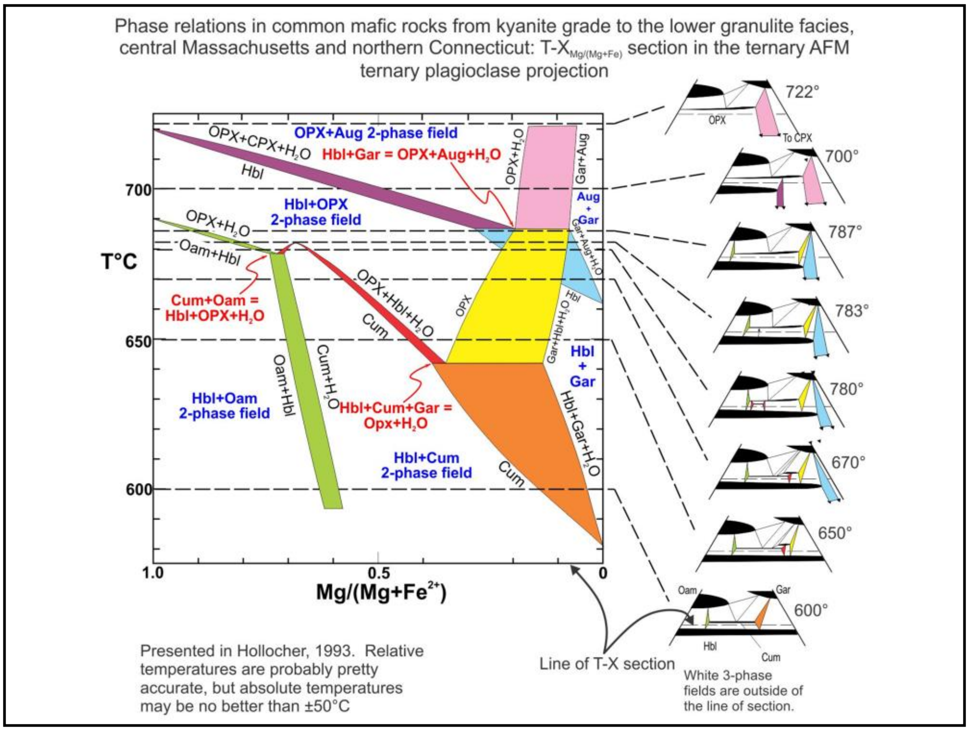
This and subsequent diagrams show the progression from relatively low grade (lower amphibolite facies) in west-central New England at a pressure of ~6 kbars. 3-phase fields move left and right, depending on the nature of the reaction. Collisions produce 4-phase fields that are univariant lines on P-T diagrams, that subsequently split up at higher temperature into two 3-phase fields.



Continuing through upper amphibolite facies to the lower granulite facies. Note how Opx starts inside of a 3-phase field (partly hypothetical), and cummingtonite vanishes at an intermediate composition that approximates an Mg’ value of 0.71. Why do you suppose 0.71 is the most stable cummingtonite?



Finishing up the phase diagram sequence. Southern New England apparently has phase relations up to diagram 12. Diagram 13 is what would be expected at higher grade, with the complete loss of amphiboles.



This is a ~6 kbar T-Mg’ section through the above series of phase diagrams showing the solid solution gaps between different coexisting phases.