Bayranvand M, Akbarinia M, Salehi Jouzani G, Gharechahi J, Alberti G (2020). **Dynamics of humus forms and soil characteristics along a forest altitudinal gradient in Hyrcanian forest**
iForest – Biogeosciences and Forestry – doi: 10.3832/ifor3444-013

Supplementary Material

Fig. S1 – (a) The Central Caspian region of northern Iran; (b) the study site at the Experimental Forest Station (Vaz watershed). ArcGIS elaborate.

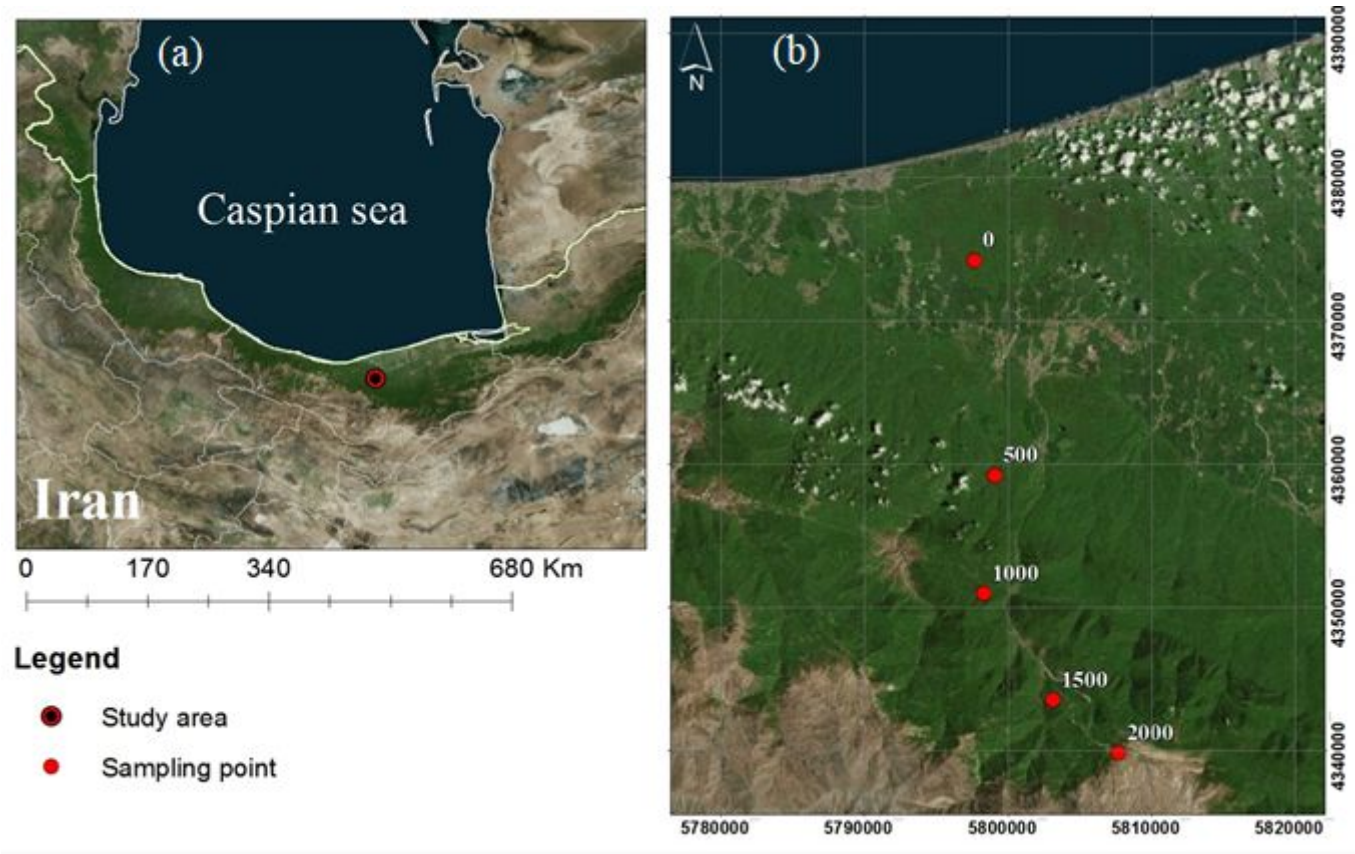

Fig. S2 - Mean monthly air temperature (°C) and precipitation (mm) at the study site based on the Noushahr city metrological station report.

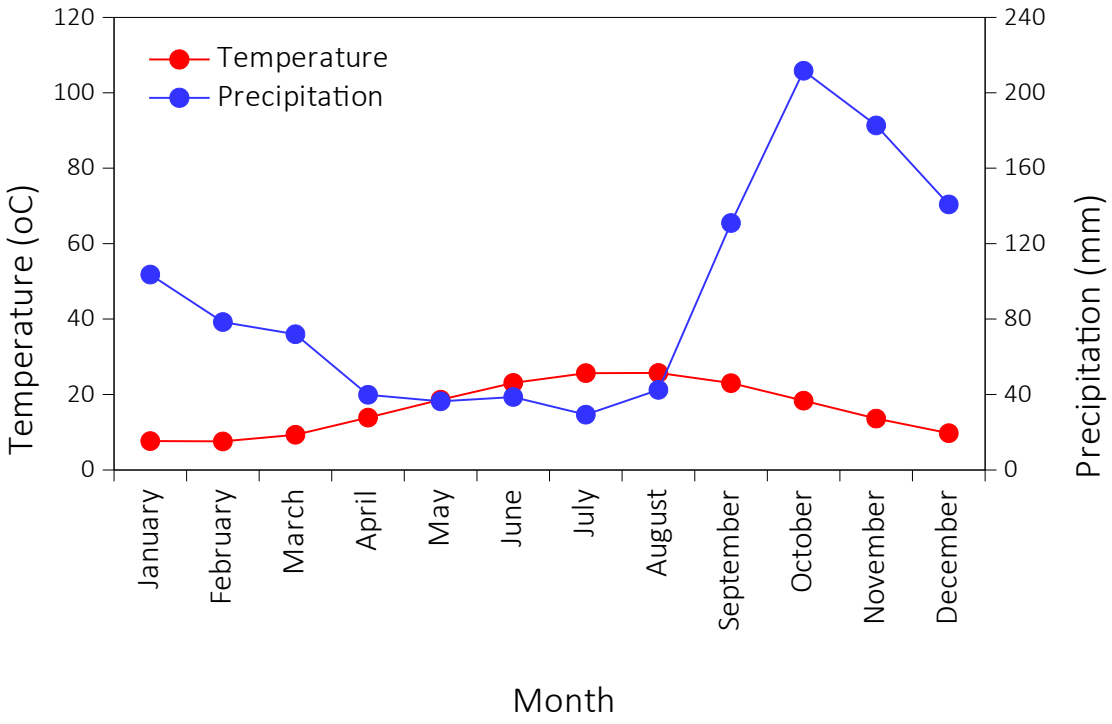

Fig. S3 - Two examples of humus profiles at the sea level (0 m a.s.l. - PMF). Left Profile: Mesomull form (with a discontinuous vOL and maA diagnostic horizons) and right profile: Oligomull form (with a vOL, presence of a discontinuous zoOF and maA horizons).

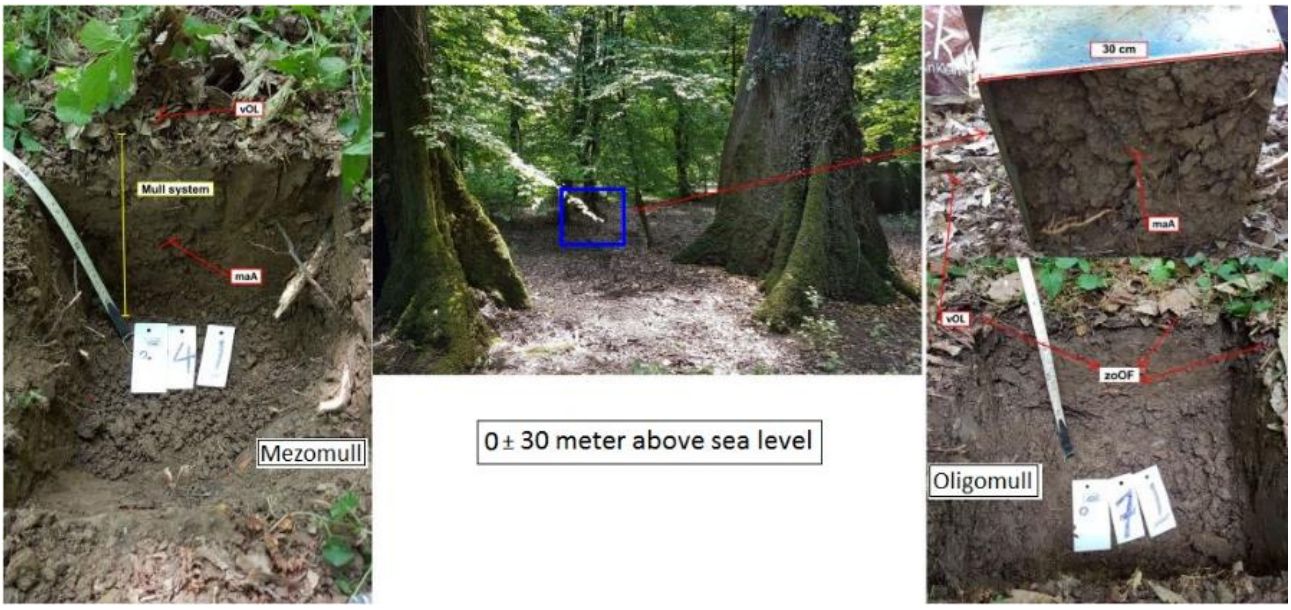

Fig. S4 - Two examples of humus profiles at the 500 m a.s.l. altitute (LMMF). Left Profile: Eumull form (with a presence of a discontinuous nOL and a biomacrostructured maA horizon with Endogeic and Anecic earthworm activity) and right profile: Mesomull form (with a discontinuous vOL and maA horizon with Endogeic and Anecic earthworm activity).

Fig. S5 - Two examples of humus profiles at the 1000 m a.s.l. altitute (MMMF). Left Profile: Leptoamphi form (with a presence of a discontinuous or thin zoOH and a biomacrostructured maA horizon with Epigeic and Anecic earthworm activity) and right profile: Oligomull form (with a vOL, presence of a discontinuous zoOF and maA horizons).

Fig. S6 - One example of humus profile at the 1500 m a.s.l. altitute (HMPF). Eumacroamphi form (with a presence of dark zoOH and a biomacrostructured with fine and coarse rocks on a maA horizon with low Epigeic earthworm activity).

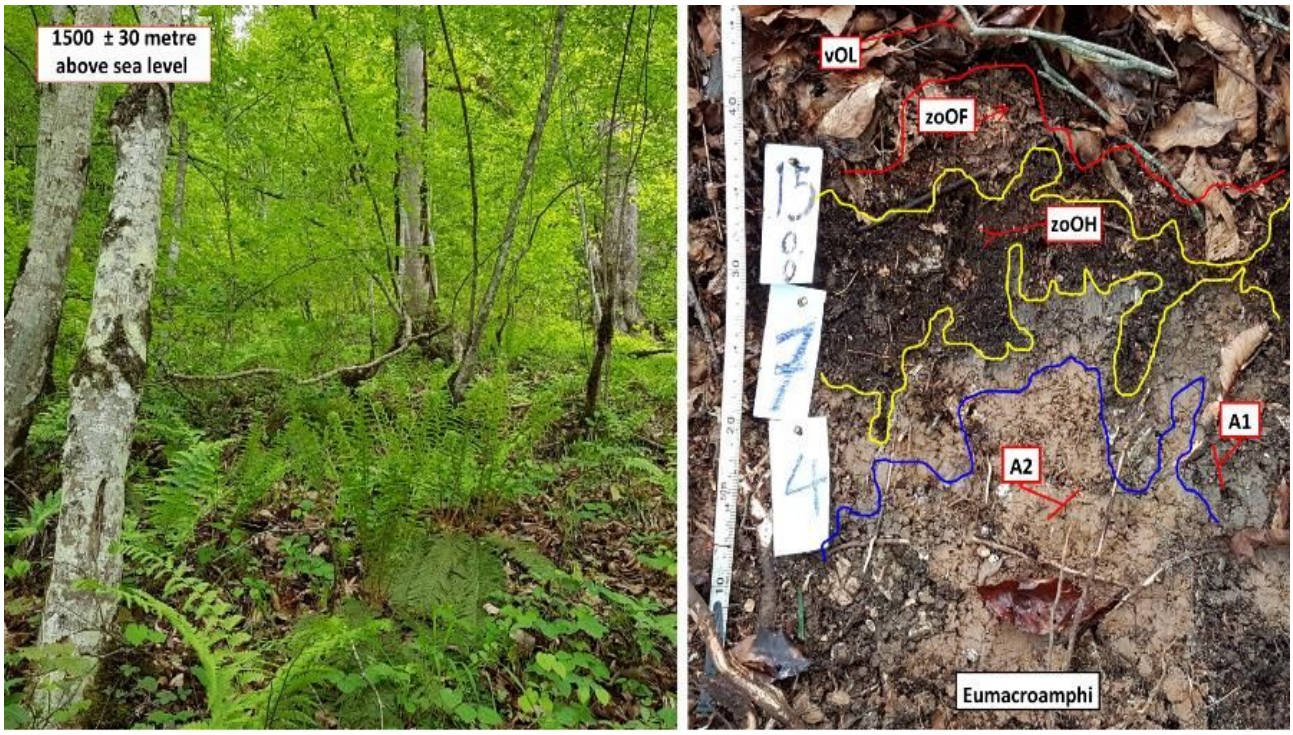

Fig. S7 - Two examples of humus profiles at the 2000 m a.s.l. altitute (F-GE). Left Profile: Rhizo Mesomull form (with a discontinuous vOL and rhiA horizon) and right profile: Rhizo Oligomull. Presence of pockets of OF horizon (with a vOL - grass leaves in this case -, presence of a rhiA horizon).

Tab. S1 - Humus systems (Mull, Rhizo Mull and Amphi), Humus forms (Eumell, Mesomull, Oligomull, Rhizo Mesomull, Rhizo Oligomull and Rhizo Dysmull; Leptoamphi, Eumacroamphi and Eumesoamphi and Pachyamphi) and their diagnosic horizons. Legend: nOL = new litter; vOL = old degraded litter; zoOF = zoogenic OF horizon; humic material (litter reduced in very small rests and animal droppings) ≤ 70% of horizon volume; zoOH = zoogenic OH horizon, present of living animals and humic material > 70%; transition = thickness of the transitional uncertain (it is difficult to assign this layer to a specific horizon) passage between organic and organic-mineral horizons; meA = mesostructured A horizons (no net dominance of a particular size of aggregates); maA macrostructured A horizons (aggregates of Ø > 4 mm dominate in volume over other aggregates); different color according diagnostic horizons = present and continuous, i.e. covering all ever the soil; disc pock = horizon covering punctually the soil in pockets or discontinuously; ecological earthworm activity such as Endogeic and Anecic.

Diagnostic horizons	**Terrestrial humus systems and forms**									
	Mull			**Rhizo Mull**			**Amphi**			
	Eumull	**Mesomull**	**Oligomull**	**Rhizo Mesomull**	**Rhizo Oligomull**	**Rhizo Dysmull**	**Leptoamphi**	**Eumacroamphi**	**Eumesoamphi**	**Pachyamphi**
nOL	disc pock								disc pock	disc pock
vOL		disc pock		disc pock						
zoOF			disc pock		disc pock					
zoOH							≤ 1mm	≥ 1 mm	< 3 mm	≥ 3 mm
Transition O/A	< 3 mm	< 3 mm	< 3 mm	< 3 mm	< 3 mm	< 3 mm	< 5 mm	< 5 mm	≥ 5 mm	≥ 5 mm
maA			or							
meA										
rhiA										
Earthworm activity	Endogeic and Anecic with high activity			Endogeic and Anecic with low activity			Epigeic and/or Anecic present		Epigeic and Anecic rarely present	