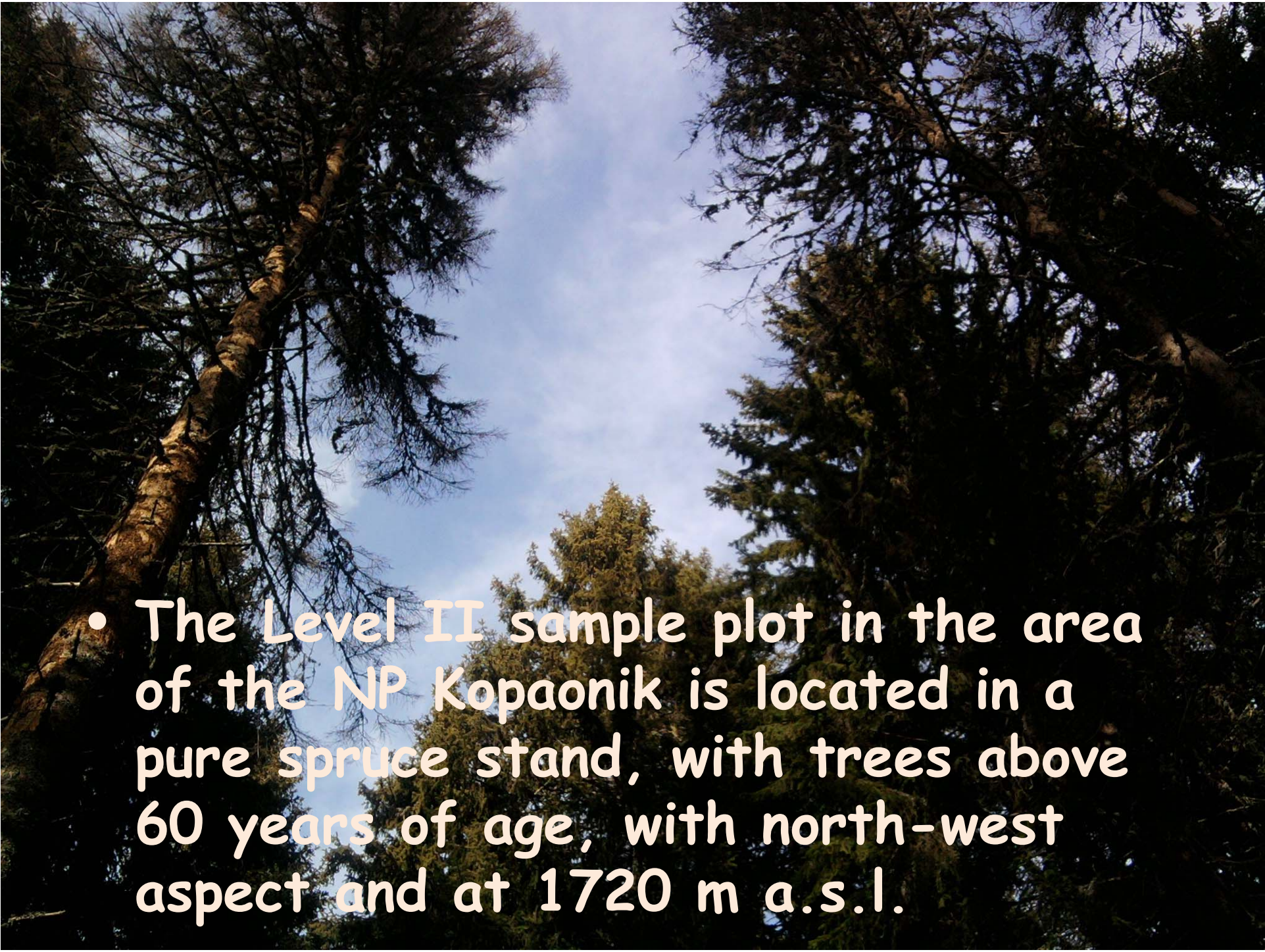
A close-up photograph of tree bark, likely from a spruce, showing extensive damage from a bark beetle outbreak. The bark is dark brown and heavily textured, with numerous small, irregular holes and deep, winding grooves carved into it by the beetles. The lighting highlights the rough, uneven surface of the bark.

Bark beetle outbreak in spruce communities within a sample plot (Level II) in the mountain Kopaonik in the period 2010-2013

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- A low-angle photograph looking up at the canopy of a dense spruce forest. The dark green needles of the trees frame a bright blue sky with wispy white clouds. The perspective emphasizes the height and density of the forest.
- The Level II sample plot in the area of the NP Kopaonik is located in a pure spruce stand, with trees above 60 years of age, with north-west aspect and at 1720 m a.s.l.

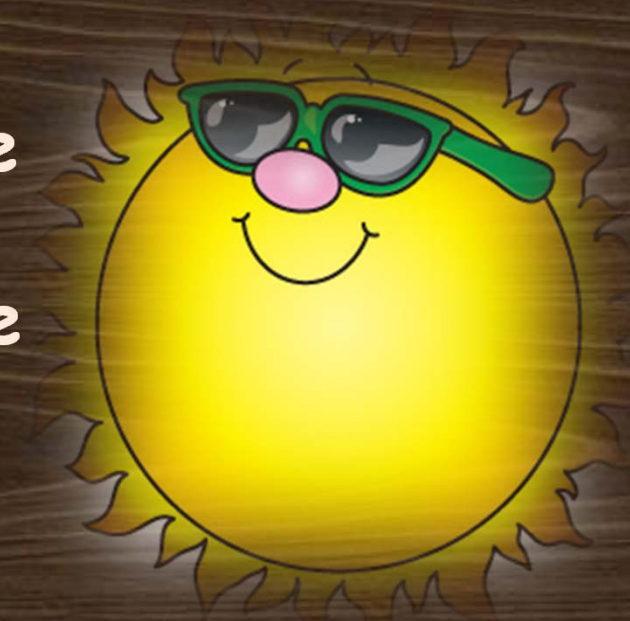
- Two most dominant species of bark beetles (*Ips typographus* and *Pityogenes chalcographus*), which are known as species with dramatic outbreaks, have been recorded since the establishment of the sample plot (2010).



- The first year attack was weak and sporadic and in 2013 it reached its culmination in some parts of the stand on this sample plot.
- Out of the total number of trees (195), 26 or 13.4% was infested by these two most dangerous species of spruce bark beetle.
- Out of the total number of infested trees 19 or 73.1% died.



- The results of the research study reveal a number of factors that have caused this outbreak.
- The following factors had significant effects on the reduction of the host vitality, which further increased their predisposition for an increasing attack of these two existing species of bark beetles: climate change, UV radiation, ozone, tree aspect, stand age, and the absence of sanitary felling, but on the first place is climate change.



- At the global level, the year of **2013** was together with the year of **2003** the fourth hottest year since the beginning of measurements in 1880.
- The average global temperature was by 0.62°C above the average (13.9°C) for the period 1981–2010.
- These data indicate a significant change in climate and a steady increase in global temperature.



- Since the first assessment of the health condition in 2010 revealed complete or partial dieback of a number of spruce trees, we assumed that the attack of the spruce bark beetle in the whole of the National park Kopaonik was initiated by the adverse weather conditions in 2003.

CONCLUSION

