

CE11-RELATED: VERY STRONG DEBLOCKING FILTERING WITH CONDITIONAL ACTIVATION SIGNALING

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Input document JVET-L0523



Introduction to Deblocking

- Improvements to VVC's deblocking functionality studied extensively in **CE11** [L0031]
- Common idea: increase filter lengths up to a maximum of **8 taps** per boundary side
 - Keep low complexity and parallel application on an **8×8** grid at the same time
- We observed that, especially for HDR input, 8-tap deblocking may **not** be sufficient
 - Main reason: luma transfer function stretches high-luma step-sizes for display
 - Result: subtle blocking becomes visible, particularly in low-activity regions
- Using **16 taps** instead of 8 may **not** be low-complexity and/or not 8×8 parallelizable
 - ...and 16-tap filtering can be dangerous due to increased risk of *smoothing-out*

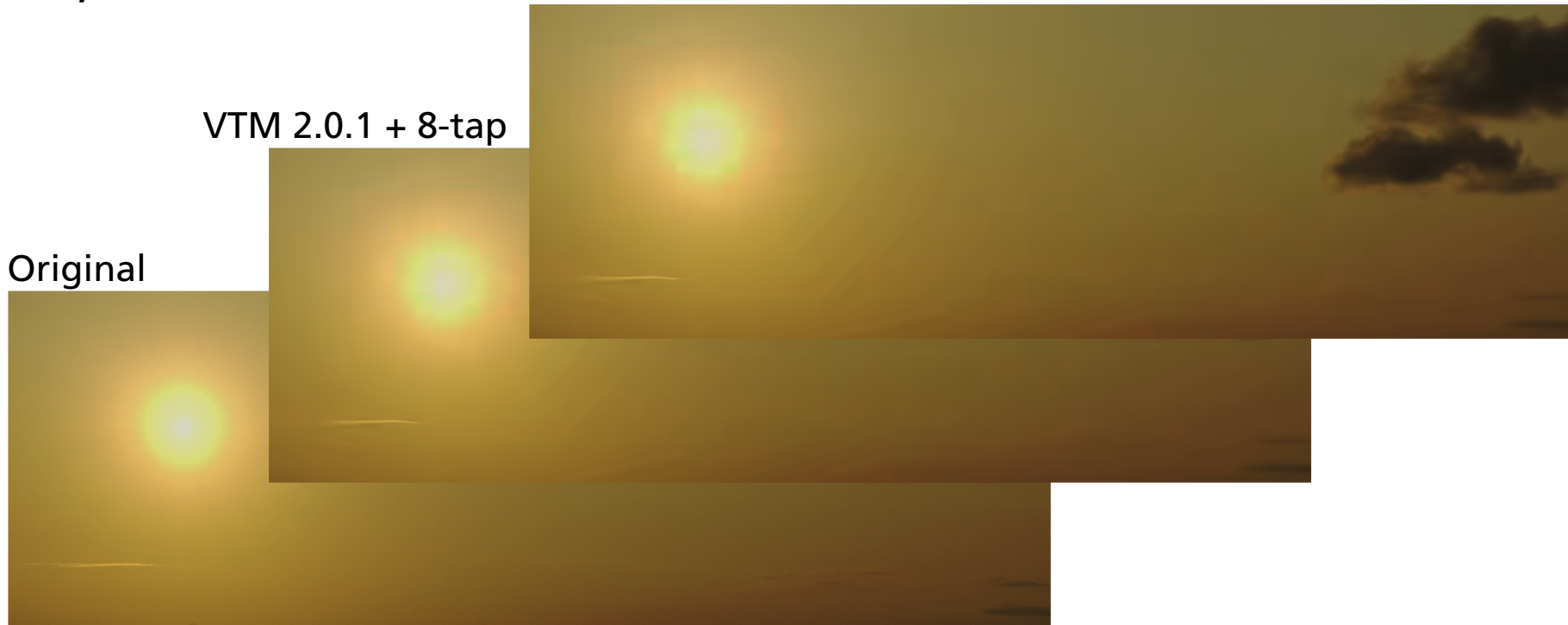
Deblocking Performance (SunsetBeach, UHD, base QP 37)

HLG, first frame

VTM 2.0.1

VTM 2.0.1 + 8-tap

Original



Deblocking Performance (enhanced contrast for projectors)

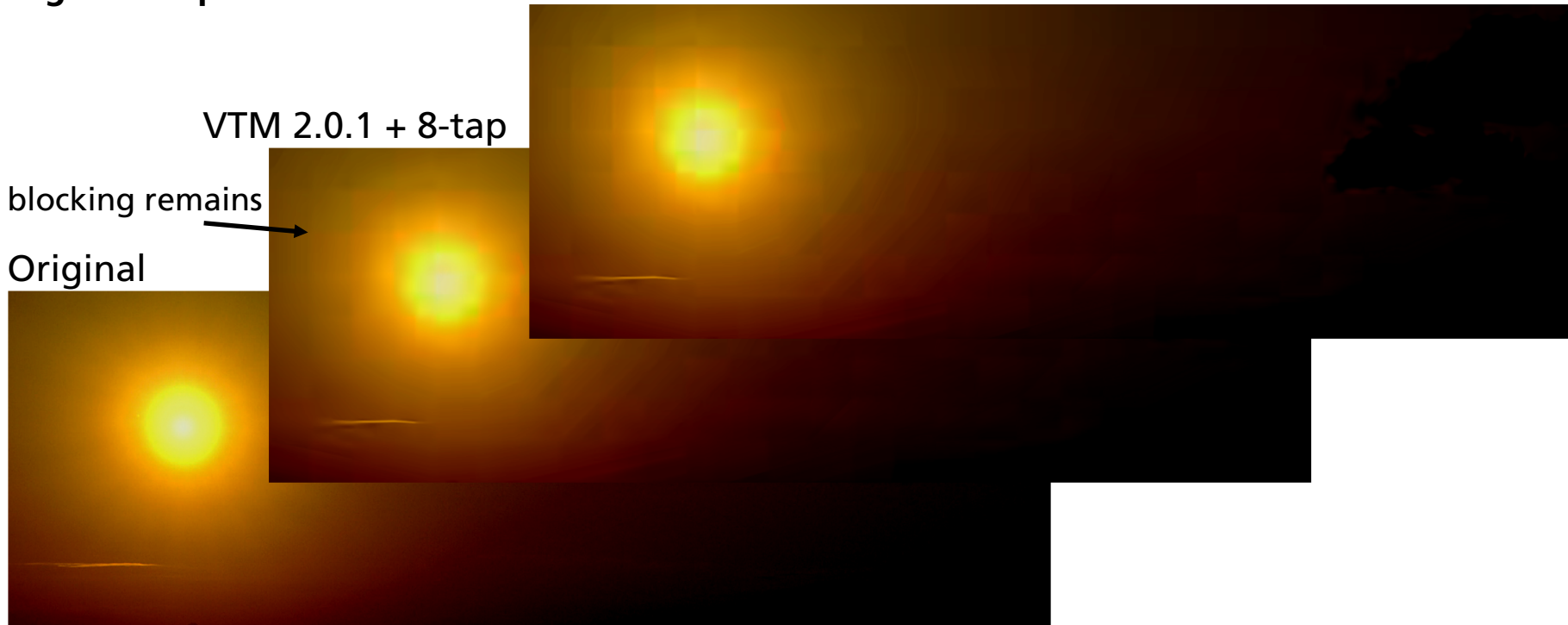
High-luma parts

VTM 2.0.1

VTM 2.0.1 + 8-tap

blocking remains

Original



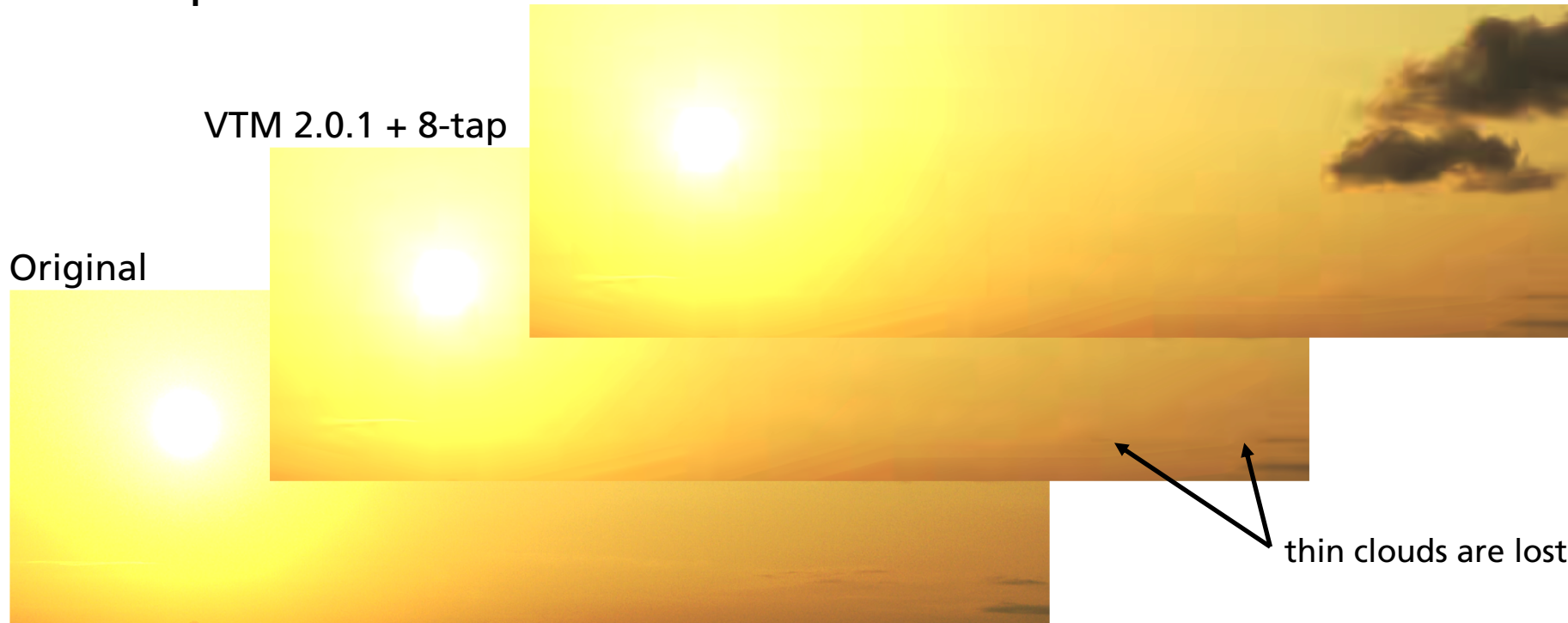
Deblocking Performance (enhanced contrast for projectors)

Low-luma parts

VTM 2.0.1

VTM 2.0.1 + 8-tap

Original



Proposed Solution: Conditional Superstrong Deblocking

- We propose a **two-aspect** solution to extend the CE11 approaches:
 - Very strong deblocking (**VSD**) filter modifying **16 pixels** on each side of boundary
 - Conditionally send filter control parameter (**FCP**) bit allowing to **disable** the VSD
 - FCP is signaled **selectively** for some CTUs but not for others (saves rate)
- FCP is sent for a CTU if (num CUs in CTU < 9) and (num Cbf=1 in CTU > 0), else FCP=0
 - If FCP == 1 in a CTU, VSD is **enabled** in all TUs with (width ≥ 32) and (height ≥ 32)
 - In smaller TUs and CTUs for which FCP == 0, use traditional/CE11-like deblocking

Advantages of Proposed Solution

- The proposed conditional superstrong deblocking bears two advantages:
 - More **aggressive** deblocking of some CTUs (e. g., sky around sun in SunsetBeach)
 - More **robust quality** since it can be disabled on difficult input (e. g., thin clouds)
- Very strong deblocking can be **tested** – and rejected – at the **encoder** side
 - If distortion in reconstructed CTU increases too much, send FCP=0, else send FCP=1
 - Nice side-effect: no BD-PSNR losses except due to FCP signaling overhead (< 0.1%)
- Suggested very strong deblocking can be **low-complexity** and **parallelizable** (e. g. 8×8)
 - Algorithm adds only **offsets** to each pixel column/row, can be processed in parallel

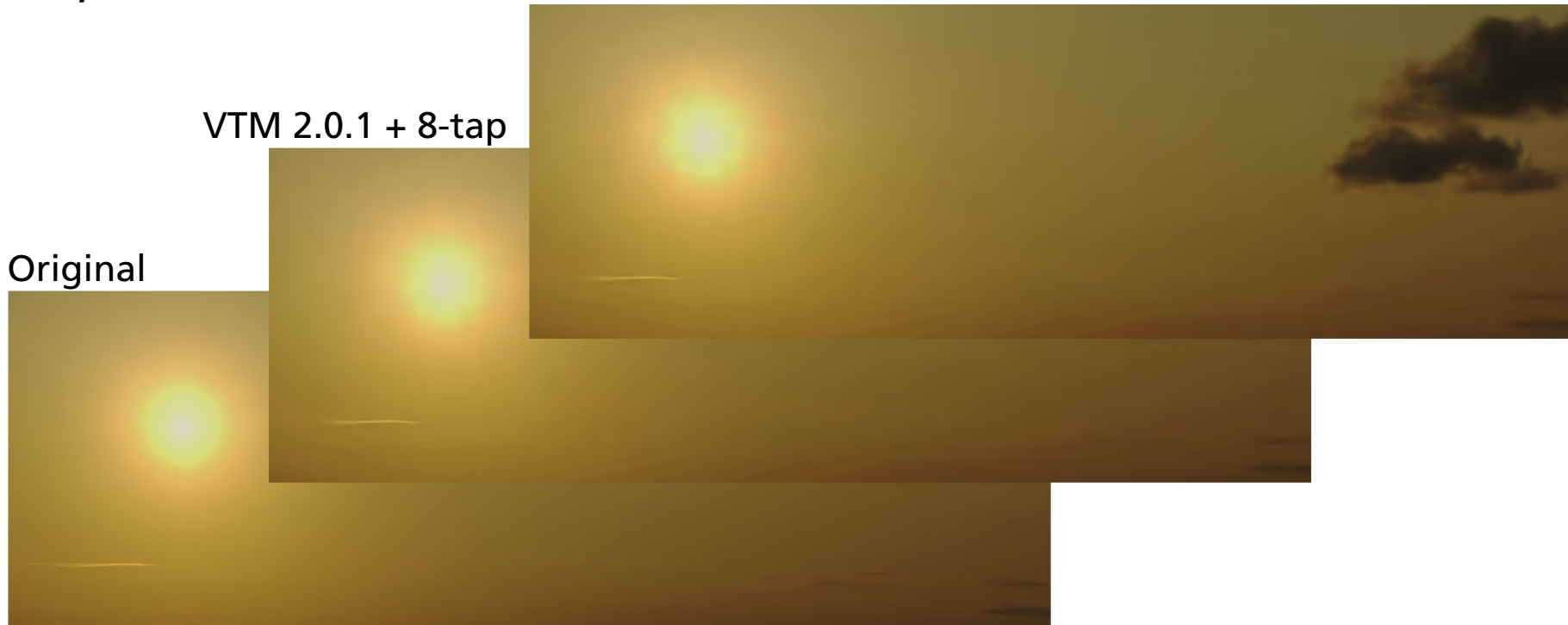
Deblocking Performance (SunsetBeach, now incl. proposal)

HLG, first frame

VTM 2.0.1 + L0523

VTM 2.0.1 + 8-tap

Original



Deblocking Performance (enhanced contrast, incl. proposal)

High-luma parts

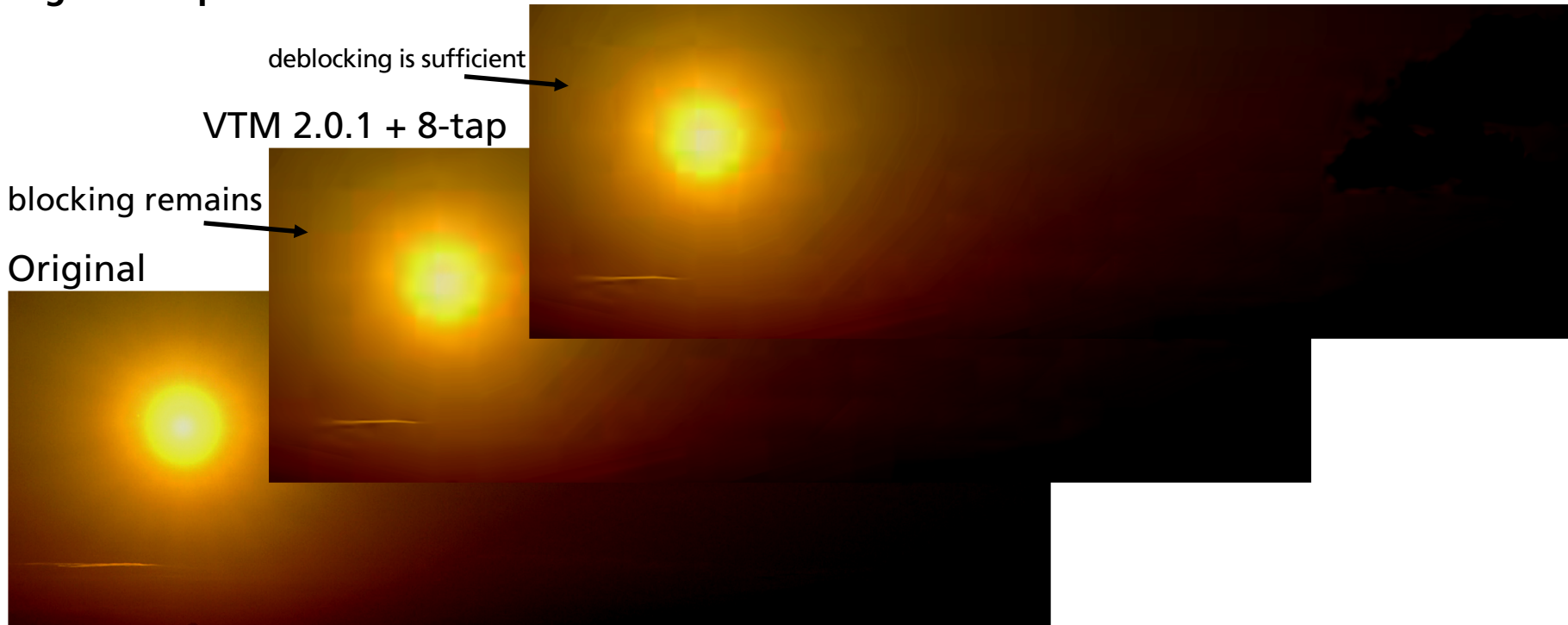
VTM 2.0.1 + L0523

deblocking is sufficient

VTM 2.0.1 + 8-tap

blocking remains

Original



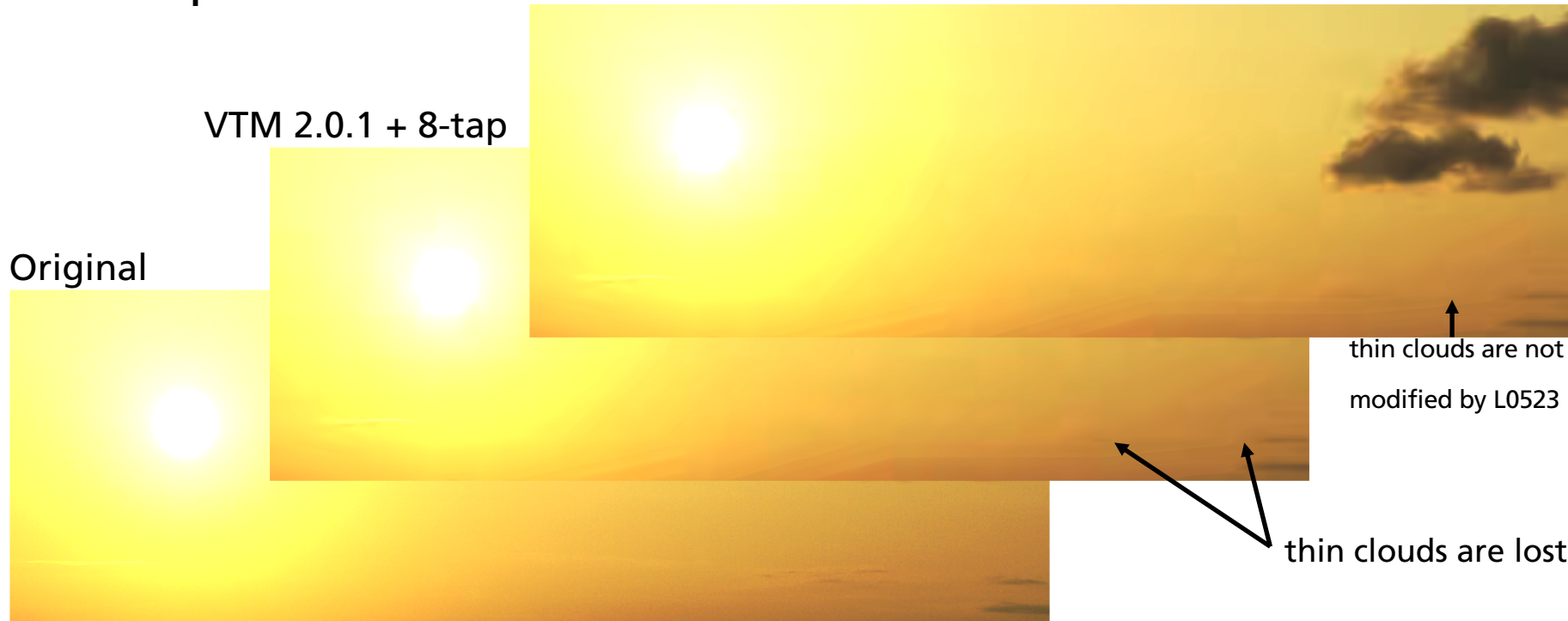
Deblocking Performance (enhanced contrast, incl. proposal)

Low-luma parts

VTM 2.0.1 + L0523

VTM 2.0.1 + 8-tap

Original



Summary and Conclusion

- Some videos (especially HDR) benefit from even stronger deblocking than used in CE11
 - Such superstrong deblocking can cause undesired smoothing-out of image content
- Proposal: introduce **conditionally signaled 16-tap very strong deblocking (VSD)** mode
 - Extension of CE11 designs by an additional VSD mode and filter control parameter
 - Apply VSD only if parameter signals enabled VSD, otherwise use CE11 deblocking
- Subjective performance is promising, objective BD-PSNR metrics and complexity are OK
- Request to study this in combination with strong deblocking from CE11 in a **new CE**
 - VSD algorithm details don't seem to be critical, could be optimized by third party